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16 SPACE TRANSPORTATION 1622

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

17 SPACECRAFT COMMUNICATION, COMMAND AND TRACKING 1622

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE 1623

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

19 SPACECRAFT INSTRUMENTATION 1624

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

20 SPACECRAFT PROPULSION AND POWER 1624

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion and Power, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

CHEMISTRY AND MATERIALS

Includes chemistry and materials (general); composite materials; inorganic and physical chemistry; metallic materials; nonmetallic materials; and propellants and fuels.

23 CHEMISTRY AND MATERIALS (GENERAL) **1626**
Includes biochemistry and organic chemistry.

24 COMPOSITE MATERIALS **1626**
Includes laminates.

25 INORGANIC AND PHYSICAL CHEMISTRY **1628**
Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.
For related information see also *77 Thermodynamics and Statistical Physics.*

26 METALLIC MATERIALS **1631**
Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

27 NONMETALLIC MATERIALS **1635**
Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

28 PROPELLANTS AND FUELS **1639**
Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

ENGINEERING

Includes engineering (general); communications; electronics and electrical engineering; fluid mechanics and heat transfer; instrumentation and photography; lasers and masers; mechanical engineering; quality assurance and reliability; and structural mechanics.
For related information see also *Physics.*

31 ENGINEERING (GENERAL) **1639**
Includes vacuum technology; control engineering; display engineering; and cryogenics.

32 COMMUNICATIONS **1642**
Includes land and global communications; communications theory; and optical communications.
For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

33 ELECTRONICS AND ELECTRICAL ENGINEERING **1645**
Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuity.
For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

34 FLUID MECHANICS AND HEAT TRANSFER **1650**
Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.
For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

35 INSTRUMENTATION AND PHOTOGRAPHY **1656**
Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.
For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation* and *19 Spacecraft Instrumentation.*

36 LASERS AND MASERS **1662**
Includes parametric amplifiers.

37 MECHANICAL ENGINEERING **1664**
Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

38 QUALITY ASSURANCE AND RELIABILITY **1666**
Includes product sampling procedures and techniques; and quality control.

39 STRUCTURAL MECHANICS **1666**
Includes structural element design and weight analysis; fatigue; and thermal stress.
For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

GEOSCIENCES

Includes geosciences (general); earth resources; energy production and conversion; environment pollution; geophysics; meteorology and climatology; and oceanography.
For related information see also *Space Sciences.*

42 GEOSCIENCES (GENERAL) **1669**

43 EARTH RESOURCES **1671**
Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography.*

44 ENERGY PRODUCTION AND CONVERSION **1672**
Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.
For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

45 ENVIRONMENT POLLUTION **1675**
Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

46 GEOPHYSICS **1677**
Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.
For space radiation see *93 Space Radiation.*

47 METEOROLOGY AND CLIMATOLOGY **1684**
Includes weather forecasting and modification.

48 OCEANOGRAPHY **1689**
Includes biological, dynamic and physical oceanography; and marine resources.

LIFE SCIENCES

Includes sciences (general); aerospace medicine; behavioral sciences; man/system technology and life support; and planetary biology.

51 LIFE SCIENCES (GENERAL) **1692**
Includes genetics.

52 AEROSPACE MEDICINE **1693**
Includes physiological factors; biological effects of radiation; and weightlessness.

53 BEHAVIORAL SCIENCES **1701**
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT **1703**
Includes human engineering; biotechnology; and space suits and protective clothing.

55 PLANETARY BIOLOGY **N.A.**
Includes exobiology; and extraterrestrial life.

MATHEMATICAL AND COMPUTER SCIENCES

Includes mathematical and computer sciences (general); computer operations and hardware; computer programming and software; computer systems; cybernetics; numerical analysis; statistics and probability; systems analysis; and theoretical mathematics.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL) **N.A.**

60 COMPUTER OPERATIONS AND HARDWARE **1704**
Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering.*

61 COMPUTER PROGRAMMING AND SOFTWARE **1705**
Includes computer programs, routines, and algorithms.

62 COMPUTER SYSTEMS **1711**
Includes computer networks.

63 CYBERNETICS **1711**
Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

64 NUMERICAL ANALYSIS **1712**
Includes iteration, difference equations, and numerical approximation.

65 STATISTICS AND PROBABILITY **1717**
Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

66 SYSTEMS ANALYSIS **1718**
Includes mathematical modeling; network analysis; and operations research.

67 THEORETICAL MATHEMATICS **1719**
Includes topology and number theory.

PHYSICS

Includes physics (general); acoustics; atomic and molecular physics; nuclear and high-energy physics; optics; plasma physics; solid-state physics; and thermodynamics and statistical physics.
For related information see also *Engineering.*

70 PHYSICS (GENERAL) **1719**
For geophysics see *46 Geophysics.* For astrophysics see *90 Astrophysics.* For solar physics see *92 Solar Physics.*

71 ACOUSTICS **1728**
Includes sound generation, transmission, and attenuation.
For noise pollution see *45 Environment Pollution.*

72 ATOMIC AND MOLECULAR PHYSICS **1729**
Includes atomic structure and molecular spectra.

73 NUCLEAR AND HIGH-ENERGY PHYSICS **N.A.**
Includes elementary and nuclear particles; and reactor theory.
For space radiation see *93 Space Radiation.*

74 OPTICS **1731**
Includes light phenomena.

75 PLASMA PHYSICS **1733**
Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics.* For space plasmas see *90 Astrophysics.*

76 SOLID-STATE PHYSICS **1738**
Includes superconductivity.
For related information see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

77 THERMODYNAMICS AND STATISTICAL PHYSICS **1745**
Includes quantum mechanics; and Bose and Fermi statistics.
For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

SOCIAL SCIENCES

Includes social sciences (general); administration and management; documentation and information science; economics and cost analysis; law and political science; and urban technology and transportation.

80 SOCIAL SCIENCES (GENERAL) **N.A.**
Includes educational matters.

81 ADMINISTRATION AND MANAGEMENT **1746**
Includes management planning and research.

82 DOCUMENTATION AND INFORMATION SCIENCE 1747
Includes information storage and retrieval technology; micrography; and library science.
For computer documentation see *61 Computer Programming and Software.*

83 ECONOMICS AND COST ANALYSIS 1752
Includes cost effectiveness studies.

84 LAW AND POLITICAL SCIENCE 1752
Includes space law; international law; international cooperation; and patent policy.

85 URBAN TECHNOLOGY AND TRANSPORTATION 1753
Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.
For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) 1754

89 ASTRONOMY 1756
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS 1757
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION 1758
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS 1759
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION 1760
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL 1761

Note: N.A. means that no abstracts were assigned to this category for this issue.

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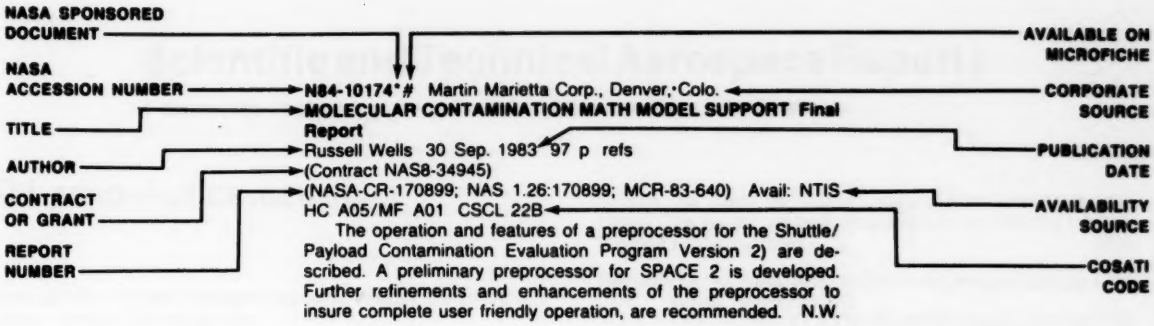
CORPORATE SOURCE INDEX I-65
CONTRACT NUMBER INDEX I-79
REPORT/ACCESSION NUMBER INDEX I-83

TYPICAL CITATION AND ABSTRACT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N84-10174*# Martin Marietta Corp., Denver, Colo.
MOLECULAR CONTAMINATION MATH MODEL SUPPORT Final Report
Russell Wells 30 Sep. 1983 97 p refs
(Contract NAS8-34945)
(NASA-CR-170899; NAS 1.26:170899; MCR-83-640) Avail: NTIS
HC A05/MF A01 CSCL 22B
The operation and features of a preprocessor for the Shuttle/ Payload Contamination Evaluation Program Version 2) are described. A preliminary preprocessor for SPACE 2 is developed. Further refinements and enhancements of the preprocessor to insure complete user friendly operation, are recommended. N.W.

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Scientific and Technical Aerospace Reports

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01 AERONAUTICS (GENERAL)

N84-20473# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INTERNATIONAL AVIATION (SELECTED ARTICLES)
Xijun Huang and Bonian Zhang 13 Jan. 1984 17 p Transl. into ENGLISH from Guoji Hangkong (China), no. 5, 1983 p 32-34
(AD-A137617; FTD-ID(RS)T-1691-83) Avail: NTIS HC A02/MF A01 CSCL 20/4

Altitude integration in design is required of advanced fighter planes using a turbojet engine for power, especial in matching the propulsion system. A two dimensional nozzle, reverse thrust/thrust direction change nozzle, back installed type intake channel, and short S-shaped subsonic compression expanding sector are a series of advanced propulsion components. Such new applications increase the mutual interference among the intake channel, fuselage and nozzle. Not only are the stream fields of the intake and exhaust channels affected, but also the stream interference between the propulsion system and the aerodynamic airfoil. During the conditions of undesigned cruising and maneuvering flight, as well as STOL/VSTOL, the effect of the interference is more obvious. Estimation of the degree of mutual interference among various components of the aircraft, including how to correctly simulate the propulsion system during wind tunnel tests were studied. Author

N84-20474# Army Troop Support Command, St. Louis, Mo. Cost Analysis Div.
HISTORICAL INFLATION PROGRAM. A COMPUTER PROGRAM GENERATING HISTORICAL INFLATION INDICES FOR ARMY AIRCRAFT: REVISION Final Technical Report
Warren H. Gille, Jr. and James R. Hamilton Jan. 1984 92 p
(AD-A137670; TROSCOM-TR-84-1) Avail: NTIS HC A05/MF A01 CSCL 05/3

This report extends and revises Technical Report 83-1 which presents and describes the Historical Inflation Program, a computer program generating historical inflation indices for Army aircraft. The program can be updated monthly, is easily revised for changes in Bureau of Labor Statistics methods, and is capable of handling data for all fiscal year formats. Output is expressed as monthly, quarterly, fiscal year, and calendar year inflation indices (in calendar year 1967 base) and inflation factors (in fiscal year base). This report contains updated tables of inflation factors, expressed in the FY 83 base. These indices and factors provide a means of adjusting historical cost data for the procurement of Army aircraft to constant year dollars. Additional features include: computations for the derivation of revised weighting factors, detailed indices enabling the adjustment of historical labor and material costs separately, a discussion of aggregate weighting factors for labor and materials (including trends from sensitivity analysis with more background materials), and additional documentation aimed at making the report useful to a large cross section of the DOD rotary wing aircraft community. This report has been revised to include the latest information concerning the UH-60A BLACK HAWK. This system has been integrated into the Historical Inflation Program for Army aircraft. GRA

N84-20475# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ACTA AERONAUTICA ET ASTRONAUTICA SINICIA (SELECTED ARTICLES)
Ren Sicong, Zhao Yongkang, and Li Zhongying 4 Jan. 1984 41 p Transl. into ENGLISH from Hangkong Xuebao (China), v. 3, no. 4, 1982 p 61-83
(AD-A137150; FTD-ID(RS)T-1693-83) Avail: NTIS HC A03/MF A01 CSCL 17/7

This paper proposes a new inertial navigation system combining the platform type and strap-down type inertial navigation systems. In this system the azimuth rate platform without azimuth stabilized loop, azimuth coordinate resolver and synchronizer are used. The azimuth angles of the platform and vehicle are obtained by an integrator from azimuth rate signals measured by an azimuth gyroscope supported on a horizontal gimbal. This type of inertial navigation system is suitable for vehicles without large angle pitching maneuvers such as transports, aerodynamic and ballistic missiles etc. This paper discusses the operational principles of the azimuth rate platform, mechanization equations. Distinguishing features of initial alignment, and the calibration and compensation for drifts of gyroscopes; at the same time, error propagation characteristics caused by various major error sources for navigation positioning velocity and attitude are simulated on a computer. B.W.

N84-20476# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FOR THE SACRED AIR SPACE OF OUR HOMELAND
Zhang Liangjin and Guo Jingbo 15 Dec. 1983 9 p Transl. into ENGLISH from Hangkong Zhishi (China), v. 149, no. 8, 1983 p 2-3
(AD-A137189; FTD-ID(RS)T-1736-83) Avail: NTIS HC A02/MF A01 CSCL 01/3

An account is given of the history of the aeronautic industry in China. The contributions of Lu Xiaopeng, the chief designer of China's first supersonic jet fighter, are detailed. R.J.F.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N84-20477# Aeronautical Research Labs., Melbourne (Australia).
AN EXPERIMENTAL INVESTIGATION OF THE AERODYNAMIC EFFECTS OF FORWARD FACING WEDGES ON THE UPPER SURFACE AND LEADING EDGE OF AN AEROFOIL, WITH

EMPHASIS ON HIGH ANGLES OF ATTACK
A. P. Brown 1983 47 p refs
(ARL-AERO-Tech-Memo-356; AR-002-976) Avail: NTIS HC A03/MF A01

A NACA 64-106 aerofoil model was wind tunnel tested with forward facing wedges at the leading edge and upper surface at the midchord position. Their effect on low speed, high incidence aerofoil aerodynamics was studied. The majority of tests were conducted at Mach 0.2 over the incidence range -10 to +20 degrees. The upper surface wedges increased drag by over 100% and reduced lift by only 10% at moderate lift coefficients, delayed the stall by about 2 deg and maintained CLMAX. The leading edge wedges with a 2% chord slot under them on the other hand increased CLMAX by between 11 and 17%, had little effect on CD and reduced variations in pitching moment prior to and following stall. E.A.K.

N84-20478*# Boeing Military Airplane Development, Seattle, Wash.
NUMERICAL SOLUTION OF THREE-DIMENSIONAL UNSTEADY TRANSONIC FLOW OVER WINGS INCLUDING INVISCID/ VISCOUS INTERACTIONS Final Report
D. P. Rizzetta and C. J. Borland Nov. 1983 81 p refs
(Contract NAS2-10762)
(NASA-CR-166561; NAS 1.26:166561) Avail: NTIS HC A05/MF A01 CSCL 01A

A numerical procedure is presented for computing the unsteady transonic flow field about three dimensional swept wings undergoing general time dependent motion. The outer inviscid portion of the flow is assumed to be governed by the modified unsteady transonic small disturbance potential equation which is integrated in the time domain by means of an efficient alternating direction implicit approximate factorization algorithm. Gross dominant effects of the shock boundary layer interaction are accounted for by a simple empirically defined model. Viscous flow regions adjacent to the wing surface and in the trailing wake are described by a set of integral equations appropriate for compressible turbulent shear layers. The two dimensional boundary layer equations are applied quasi-statically stripwise across the span. Coupling with the outer inviscid flow is implemented through use of the displacement thickness concept within the limitations of small disturbance theory. Validity of the assumptions underlying the method is established by comparison with experimental data for the flow about a high aspect ratio transport wing having an advanced airfoil section. Author

N84-20479*# Boeing Commercial Airplane Co., Seattle, Wash.
A METHOD FOR COMPUTING THE LEADING-EDGE SUCTION IN A HIGHER-ORDER PANEL METHOD
F. Edward Ehlers and Marjorie E. Manro Mar. 1984 42 p refs
(Contract NAS1-16740)
(NASA-CR-3730; NAS 1.26:3730; D6-52135) Avail: NTIS HC A03/MF A01 CSCL 01A

Experimental data show that the phenomenon of a separation induced leading edge vortex is influenced by the wing thickness and the shape of the leading edge. Both thickness and leading edge shape (rounded rather than point) delay the formation of a vortex. Existing computer programs used to predict the effect of a leading edge vortex do not include a procedure for determining whether or not a vortex actually exists. Studies under NASA Contract NAS1-15678 have shown that the vortex development can be predicted by using the relationship between the leading edge suction coefficient and the parabolic nose drag. The linear theory FLEXSTAB was used to calculate the leading edge suction coefficient. This report describes the development of a method for calculating leading edge suction using the capabilities of the higher order panel methods (exact boundary conditions). For a two dimensional case, numerical methods were developed using the double strength and downwash distribution along the chord. A Gaussian quadrature formula that directly incorporates the logarithmic singularity in the downwash distribution, at all panel edges, was found to be the best method. Author

N84-20480*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
GENERALIZATION OF THE SUBSONIC KERNEL FUNCTION IN THE S-PLANE, WITH APPLICATIONS TO FLUTTER ANALYSIS
Herbert J. Cunningham and Robert N. Desmarais Mar. 1984 39 p refs
(NASA-TP-2292; L-15708; NAS 1.60:2292) Avail: NTIS HC A03/MF A01 CSCL 01A

A generalized subsonic unsteady aerodynamic kernel function, valid for both growing and decaying oscillatory motions, is developed and applied in a modified flutter analysis computer program to solve the boundaries of constant damping ratio as well as the flutter boundary. Rates of change of damping ratios with respect to dynamic pressure near flutter are substantially lower from the generalized-kernel-function calculations than from the conventional velocity-damping (V-g) calculation. A rational function approximation for aerodynamic forces used in control theory for s-plane analysis gave rather good agreement with kernel-function results, except for strongly damped motion at combinations of high (subsonic) Mach number and reduced frequency. Author

N84-20481*# Lockheed-Georgia Co., Marietta.
EXPERIMENTAL STUDY OF THE SEPARATING CONFLUENT BOUNDARY-LAYER. VOLUME 2: EXPERIMENTAL DATA Final Report
J. A. Braden, R. R. Whipkey, G. S. Jones, and D. E. Lilley Mar. 1983 81 p refs
(Contract NAS1-16028)
(NASA-CR-166018; NAS 1.26:166018; LG82ER0184) Avail: NTIS HC A05/MF A01 CSCL 01A

An experimental low speed study of the separating confluent boundary layer on a NASA GAW-1 high lift airfoil is described. The airfoil was tested in a variety of high lift configurations comprised of leading edge slat and trailing edge flap combinations. The primary test instrumentation was a two dimensional laser velocimeter (LV) system operating in a backscatter mode. Surface pressures and corresponding LV derived boundary layer profiles are given in terms of velocity components, turbulence intensities and Reynolds shear stresses as characterizing confluent boundary layer behavior up to and beyond stall. LV derived profiles and associated boundary layer parameters and those obtained from more conventional instrumentation such as pitot static transverse, Preston tube measurements and hot-wire surveys are compared. E.A.K.

N84-20482*# Continuum Dynamics, Inc., Princeton, N. J.
COMPUTER PROGRAM FOR PREDICTION OF THE DEPOSITION OF MATERIAL RELEASED FROM FIXED AND ROTARY WING AIRCRAFT
Milton E. Teske Mar. 1984 97 p
(Contract NAS1-16031)
(NASA-CR-3780; NAS 1.26:3780) Avail: NTIS HC A05/MF A01 CSCL 01A

This is a user manual for the computer code "AGDISP" (AGricultural DISPersal) which has been developed to predict the deposition of material released from fixed and rotary wing aircraft in a single-pass, computationally efficient manner. The formulation of the code is novel in that the mean particle trajectory and the variance about the mean resulting from turbulent fluid fluctuations are simultaneously predicted. The code presently includes the capability of assessing the influence of neutral atmospheric conditions, inviscid wake vortices, particle evaporation, plant canopy and terrain on the deposition pattern. Author

N84-20483# Cranfield Inst. of Tech., Bedfordshire (England). Coll. of Aeronautics.
BODIES IN COMPRESSIBLE FLOW: THE USE OF AXIAL SINGULARITY DISTRIBUTIONS
P. A. T. Christopher and C. T. Shaw Nov. 1983 59 p refs
(Coll-Aeron.-8329) Avail: NTIS HC A04/MF A01

Techniques that could be used to extend axial singularity methods for incompressible flow, to deal with compressibility effects

are discussed. In particular the accuracy of common linearization methods was investigated, together with methods for the iterative solution of the full potential equation using distributions of sources in the flow field. These field sources account for the non-linear terms in the equations, and a computer program was written to implement the method. For a range of body shapes, and subsonic Mach numbers, simple distributions of sources in the field lead to accurate results after only four iterations. Author

N84-20484# Cranfield Inst. of Tech., Bedfordshire (England). College of Aeronautics.
GROUND EFFECT ON A ROTOR WAKE
E. A. Boyd and L. Kusmarwanto Aug. 1983 53 p refs
(ISBN-0-902937-93-6) Avail: NTIS HC A04/MF A01

An experimental study of the ground effect on a rotor wake when the rotor is operating at a height of less than one rotor diameter above the ground is reported. Particular attention was paid to how the rotor slipstream reacts to the oncoming wind and to the ground vortex generated when the wake eventually strikes the ground. The rotor wake was visualized by smoke, the ground vortex by a tuft grid and smoke and the ground interaction boundary by a surface flow visualization. An attempt was made to measure the strength of the ground vortex using pitot and static tubes fine enough to cause little disturbance to the vortex field. Details are given of a new rig planned to extend the reported measurements. Author

N84-20485*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENTROPY CONDITION SATISFYING APPROXIMATIONS FOR THE FULL POTENTIAL EQUATIONS OF TRANSONIC FLOW
Stanley Osher (California Univ.), Woodrow Whitlow, Jr., and Mohamed Hafez (Computer Dynamics, Inc.) Jan. 1984 58 p refs
(NASA-TM-85751; NAS 1.15:85751) Avail: NTIS HC A04/MF A01 CSCL 01A

A class of conservative difference approximations for the steady full potential equation was presented. They are, in general, easier to program than the usual density biasing algorithms, and in fact, differ only slightly from them. Rigorous proof indicated that these new schemes satisfied a new discrete entropy inequality, which ruled out expansion shocks, and that they have sharp, steady, discrete shocks. A key tool in the analysis is the construction of a new entropy inequality for the full potential equation itself. Results of some numerical experiments using the new schemes are presented. M.A.C.

N84-20486*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WING PLANFORM EFFECTS AT SUPERSONIC SPEEDS FOR AN ADVANCED FIGHTER CONFIGURATION
Richard M. Wood and David S. Miller Mar. 1984 117 p refs
(NASA-TP-2269; L-15706; NAS 1.60:2269) Avail: NTIS HC A06/MF A01 CSCL 01A

Four advanced fighter configurations, which differed in wing planform and airfoil shape, were investigated in the Langley Unitary Plan Wind Tunnel at Mach numbers of 1.60, 1.80, 2.00, and 2.16. Supersonic data were obtained on the four uncambered wings, which were each attached to a single fighter fuselage. The fuselage geometry varied in cross-sectional shape and had two side-mounted, flow-through, half-axisymmetric inlets. Twin vertical tails were attached to the fuselage. The four planforms tested were a 65 deg delta wing, a combination of a 20 deg trapezoidal wing and a 45 deg horizontal tail, a 70 deg/30 deg cranked wing, and a 70 deg/66 deg crank wing, where the angle values refer to the leading-edge sweep angle of the lifting-surface planform. Planform effects on a single fuselage representative of an advanced fighter aircraft were studied. Results show that the highly swept cranked wings exceeded the aerodynamic performance levels, at low lift coefficients, of the 65 deg delta wing and the 20 deg trapezoidal wing at trimmed and untrimmed conditions. Author

N84-20487*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POTENTIAL FLOW THROUGH A CASCADE OF ALTERNATELY DISPLACED CIRCULAR BODIES: THE ROD-WALL WIND TUNNEL BOUNDARY CONDITIONS
Joel L. Everhart Mar. 1984 22 p refs
(NASA-TM-85750; L-15617; NAS 1.15:85750) Avail: NTIS HC A02/MF A01 CSCL 01A

The classic slotted-wall boundary-condition coefficient for rod-wall wind tunnels is derived by approximating the potential flow solution through a cascade of two staggered rows of rods. A comparison with the corrected Chen and Mears solution for flow through an unstaggered cascade is made. Author

N84-20488*# Southern Methodist Univ., Dallas, Tex.
AN EXPERIMENTAL STUDY OF THE PROPERTIES OF SURFACE PRESSURE FLUCTUATIONS IN STRONG ADVERSE PRESSURE GRADIENT TURBULENT BOUNDARY LAYERS Final Report, 1 Dec. 1982 - 31 Jan. 1984
Roger L. Simpson 25 Mar. 1984 8 p refs
(Grant NAG-317)
(NASA-CR-175410; NAS 1.26:175410) Avail: NTIS HC A02/MF A01 CSCL 01A

Experimental data were obtained on blade self-noise generation by strong adverse-pressure-gradient attached boundary layers and by separated turbulent boundary layers that accompany stall. Two microphones were calibrated, placed in plastic housing, and installed in a wind tunnel where observations of acoustic and turbulent signals permitted decomposition of the surface pressure fluctuation signals into the propagated acoustic part and the turbulent-flow generated portion. To determine the convective wave speed of the turbulent contributions, the microphones were spaced a small distance apart in the streamwise direction and correlations were obtained. The turbulent surface pressure spectra upstream of detachment and downstream of the beginning of separation are discussed as well as measurements of turbulent velocity spectra and wavespeeds. A.R.H.

N84-20489*# National Aeronautics and Space Administration, Washington, D. C.
KINEMATICS, INFLUENCE FUNCTIONS AND FIELD QUANTITIES FOR DISTURBANCE PROPAGATION FROM MOVING DISTURBANCE SOURCES
Arabindo Das Jan. 1984 63 p refs Transl. into ENGLISH of "Kinematik, Einflussfunktonen und Feldgroessen bei Storeungsausbreitung von Bewegetn Stoerquellen" rept. DFVLR-FB-83-01 DFVLR, Braunschweig, West Germany, Oct. 1983 64 p Original language document was announced as N83-27964 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77410; NAS 1.15:77410; DFVLR-FB-83-01) Avail: NTIS HC A04/MF A01 CSCL 01A

A unified method is presented for deriving the influence functions of moving singularities which determine the field quantities in aerodynamics and aeroacoustics. The moving singularities comprise volume and surface distributions having arbitrary orientations in space and to the trajectory. Hence one generally valid formula for the influence functions which reveal some universal relationships and remarkable properties in the disturbance fields. The derivations used are completely consistent with the physical processes in the propagation field, such that treatment renders new descriptions for some standard concepts. The treatment is uniformly valid for subsonic and supersonic Mach numbers. Author

N84-20490*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PROGRESS TOWARD THE DEVELOPMENT OF AN AIRCRAFT ICING ANALYSIS CAPABILITY
Robert J. Shaw 1984 37 p refs Presented at the 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984; sponsored by AIAA
(NASA-TM-83562; E-1941; NAS 1.15:83562) Avail: NTIS HC A03/MF A01 CSCL 01A

An overview of the NASA efforts to develop an aircraft icing

analysis capability is presented. Discussions are included of the overall and long term objectives of the program as well as current capabilities and limitations of the various computer codes being developed. Descriptions are given of codes being developed to analyze two and three dimensional trajectories of water droplets, airfoil ice accretion, aerodynamic performance degradation of components and complete aircraft configurations, electrothermal deicer, and fluid freezing point depressant deicer. The need for bench mark and verification data to support the code development is also discussed. Author

N84-20491*# Continuum Dynamics, Inc., Princeton, N. J.
NUMERICAL STUDIES OF THE DEPOSITION OF MATERIAL RELEASED FROM FIXED AND ROTARY WING AIRCRAFT Final Report
Alan J. Bilanin and Milton E. Teske Washington NASA Mar. 1984 61 p refs
(Contract NAS1-16031) .
Avail: NTIS HC A04/MF A01 CSCL 01A

The computer code AGDISP (AGricultural DISPersal) has been developed to predict the deposition of material released from fixed and rotary wing aircraft in a single-pass, computationally efficient manner. The formulation of the code is novel in that the mean particle trajectory and the variance about the mean resulting from turbulent fluid fluctuations are simultaneously predicted. The code presently includes the capability of assessing the influence of neutral atmospheric conditions, inviscid wake vortices, particle evaporation, plant canopy and terrain on the deposition pattern. In this report, the equations governing the motion of aerially released particles are developed, including a description of the evaporation model used. A series of case studies, using AGDISP, are included. Author

N84-20492*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
INTERACTION OF TWO-DIMENSIONAL TRANSVERSE JET WITH A SUPERSONIC MAINSTREAM Research Report, period ending Aug. 1983
G. O. Kraemer and S. N. Tiwari Dec. 1983 124 p refs
(Grant NGR-47-003-052)
(NASA-CR-175446; NAS 1.26:175446) Avail: NTIS HC A06/MF A01 CSCL 01A

The interaction of a two dimensional sonic jet injected transversely into a confined main flow was studied. The main flow consisted of air at a Mach number of 2.9. The effects of varying the jet parameters on the flow field were examined using surface pressure and composition data. Also, the downstream flow field was examined using static pressure, pitot pressure, and composition profile data. The jet parameters varied were gapwidth, jet static pressure, and injectant species of either helium or nitrogen. The values of the jet parameters used were 0.039, 0.056, and 0.109 cm for the gapwidth and 5, 10, and 20 for the jet to mainstream static pressure ratios. The features of the flow field produced by the mixing and interaction of the jet with the mainstream were related to the jet momentum. The data were used to demonstrate the validity of an existing two dimensional elliptic flow code. S.L.

N84-20493*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL INVESTIGATION OF TANGENTIAL BLOWING APPLIED TO A SUBSONIC V/STOL INLET
Richard R. Burley Apr. 1984 20 p refs
(NASA-TP-2297; E-1907; NAS 1.60:2297) Avail: NTIS HC A02/MF A01 CSCL 01A

Engine inlets for subsonic V/STOL aircraft must operate over a wide range of conditions without the severe internal flow separation that can cause sudden changes in engine thrust, excessively high fan blade stresses, and possibly core-compressor stall. An experimental investigation was conducted to evaluate the effectiveness of tangential blowing to maintain attached flow at high inlet angles of attack. The inlet had a relatively thin lip (lip contraction ratio of 1.46). Two blowing slot locations were investigated: one on the lip and the other in the diffuser. The effect of two slot heights (0.0508 and 0.152 cm) and three slot circumferential extents, the largest being 120 deg, also was investigated. The results showed that both lip and diffuser blowing were effective in maintaining attached flow at high angles of attack. However, higher angle-of-attack capability was achieved with lip blowing than with diffuser blowing. This capability was achieved with the largest slot circumferential extent and either of the two slot heights. The tests were conducted in a low-speed wind tunnel at free-stream velocities between 18 and 62 m/sec and inlet angles of attack to 110 deg. B.W.

N84-20494*# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
THE STATUS OF ANALYTICAL PREPARATION FOR 2-DIMENSIONAL TESTING AT HIGH TRANSONIC SPEEDS IN THE UNIVERSITY OF SOUTHAMPTON TRANSONIC SELF-STREAMLINING WIND TUNNEL
M. C. Lewis Mar. 1984 28 p refs
(Contract NsG-7172)
(NASA-CR-3785; NAS 1.26:3785) Avail: NTIS HC A03/MF A01 CSCL 01A

Validation data from the Transonic Self-Streamlining Wind Tunnel has proved the feasibility of streamlining two dimensional flexible walls at low speeds and up to transonic speeds, the upper limit being the speed where the flexible walls are just supercritical. At this condition, breakdown of the wall setting strategy is evident in that convergence is neither as rapid nor as stable as for lower speeds, and wall streamlining criteria are not always completely satisfied. The only major step necessary to permit the extension of two dimensional testing into higher transonic speeds is the provision of a rapid algorithm to solve for mixed flow in the imagery flow fields. The status of two dimensional high transonic testing in the Transonic Self-Streamlining Wind Tunnel is outlined and, in particular, the progress of adapting an algorithm, which solves the Transonic Small Perturbation Equation, for predicting the imagery flow fields is detailed. Author

N84-20495*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
WINGTIP VORTEX PROPELLER Patent Application
James C. Patterson, Jr., inventor (to NASA) Filed 2 Feb. 1984 16 p
(NASA-Case-LAR-13019-1; US-Patent-Appl-SN-576308) Avail: NTIS HC A02/MF A01 CSCL 01A

A device which increases the energy efficiency and aerodynamic properties of aircraft was developed. A wingtip pusher propeller is positioned aft of the wingtip to rotate in the crossflow of the wingtip vortex. The propeller rotates against the vortex swirl creating additional thrust from and attenuating the wingtip vortex by simultaneously extracting energy from the vortex and converting it to propeller blade-induced thrust. The propeller injects its high energy wake into the vortex axial flow to dissipate the vortex. The device increases aircraft fuel efficiency by simultaneously increasing thrust and decreasing vortex induced drag. By attenuating the vortex, safety to following aircraft is maximized. NASA

N84-20496# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE PRESENT CALCULATION METHOD OF ADHERING LAYERS ON AIRCRAFT WINGS
H. Bao 13 Jan. 1984 13 p Transl. into ENGLISH from Guoji Hangkong (China), no. 5, 1983 p 23-25
(AD-A137585; FTD-ID(RS)T-1692-83) Avail: NTIS HC A02/MF A01 CSCL 20/4

An overview of the analytical calculation methods used on the viscous adhering layer and the applications concerning the interference effect of non viscous flow was examined. The differential method solved the partial differential equations based on the adhering layer equations including the appropriate Reynolds stress hypothesis. The integration method integrated the main equations in advance along the thickness direction of the adher-

ing layers. The integration method was inferior to the differential method in adapting to different types of flow. The difficulty of non convergence in successive substitution may occur in the calculation process of two algebraic model methods. The solution of adhering layer equations is sensitive to different mechanical models and varying processing methods. M.A.C.

N84-20497# Boeing Vertol Co., Philadelphia, Pa.
INVESTIGATION OF OPERATIONAL AND DESIGN FACTORS RESULTING FROM MAIN ROTOR AND TAIL ROTOR INTERACTIONS Final Report, 8 Jul. 1980 - 8 Nov. 1982
P. F. Sheridan, E. J. Hanker, Jr., and B. B. Blake Fort Eustis, Va. Army Research and Technology Labs. Jan. 1984 162 p
(Contracts DAAK51-80-C-0025; DAAG29-78-C-0021; DA Proj. 1L1-62209-AH-76)
(AD-A137710; USAAVRADCOM-TR-82-D-40) Avail: NTIS HC A08/MF A01 CSCL 20/4

An experimental investigation was conducted at the Boeing 20-ft x 20-ft V/STOL wind tunnel to study the aerodynamic interactions of the main rotor and tail rotor of a single rotor helicopter in ground effect. The model used for this test was the YUH-61A UTTAS at a scale of 1/4.85 with both rotors operated at full scale tip speed. A comprehensive array of parametric data was obtained to examine the interactions between main rotor/tail, rotor/fin, and main rotor/fin for various wind azimuths and airspeeds. Extensive flow visualization records were taken to define the flow mechanisms involved. In addition, quantitative data of the flow characteristics were provided by hot film measurements. Tests were conducted at the four principal wind azimuths of 0, +90, 180, -90 degrees. Parametric sweeps of airspeed, main rotor thrust, and tail rotor thrust were studied at each yaw condition. Limited investigations of the effects of varying fin size and height above the ground supplemented the parametric sweeps for the right sideward and rearward flight conditions. The effects of tail rotor placement were also investigated for the tail rotor power critical flight condition of 35 knots sideward to the right. GRA

N84-20498# Grumman Aerospace Corp., Bethpage, N.Y. Research and Development Center.
AN INVESTIGATION OF TURBULENCE MECHANISMS IN V/STOL UPWASH FLOW FIELDS Annual Report, Mar. 1982 - Mar. 1983
Barry L. Gilbert May 1983 36 p
(Contract F49620-82-C-0025; AF Proj. 2307)
(AD-A137775; RE-667; AFOSR-84-0087TR; AR-1) Avail: NTIS HC A03/MF A01 CSCL 20/4

The results of the first year of an experimental investigation of the abnormally high turbulence level and mixing layer growth rate characteristics found in the upwash regions of V/STOL flows in ground effect are presented. The overall objectives of this program were to examine the origin of the increased fluctuations, to systematically characterize the development and structure of the upwash, and to determine the parameters that influence these characteristics. The approach adopted was to investigate the fundamental turbulent V/STOL upwash mechanisms in increasingly more complex flow configurations. In the first year's effort, a two dimensional upwash was formed by the collision of opposed two dimensional wall jets. Extensive measurements were made in the two dimensional wall jet to establish the starting conditions of the upwash. Evaluation of these measurements have shown classical wall jet behavior, and by the time the wall jet reaches the collision zone, both the mean and turbulence profiles are fully developed. A unique set of velocity profiles was obtained at six locations in the upwash. By using an X-probe anemometer, two components of the velocity were found simultaneously. This baseline set of two component velocity profiles has never been reported before. While the turbulence levels and mixing layer growth rates were larger than those found in a free two dimensional jet, these values were less than those reported by previous investigators. GRA

N84-20499# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TWO-DIMENSIONAL WIND TUNNEL WALL INTERFERENCE
M. Mokry, Y. Y. Chan, D. J. Jones, and L. H. Ohman, ed. Nov. 1983 195 p
(AD-A138964; AGARD-AG-281; ISBN-92-835-1463-7) Avail: NTIS HC A09/MF A01 CSCL 01/1

Developments in the understanding of the wall interference problem associated with two dimensional wind tunnel testing at subsonic and transonic speeds are described. Wall boundary conditions, asymptotic analysis of wall interference, classical and extended wall interference theories, wall interference corrections from boundary measurements, integral equation formulation of subcritical wall interference, and effects of side wall boundary layer on two dimensional tests are discussed. Unsteady wall interference at subsonic and supersonic flow conditions is reviewed. Advances in the adaptive wall technique, which actively reduces or eliminates wall interference, are described. E.A.K.

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N84-20500# National Transportation Safety Board, Washington, D. C. Bureau of Accident Investigation.
AIRCRAFT ACCIDENT REPORT: EASTERN AIR LINES, INC., BOEING 727-225, N8838E, RALEIGH, NORTH CAROLINA, NOVEMBER 12, 1975
7 Sep. 1983 89 p
(PB83-910406; NTSB/AAR-83/06) Avail: NTIS HC A05/MF A01 CSCL 01C

The revised accident report and the probable cause of an aircraft accident is presented. It was determined that the probable cause of the accident was an encounter with heavy rain and associated downdrafts and wind shear during the final stages of landing when the airplane was less than 100 feet above the ground. The sudden onset of the meteorological conditions did not allow sufficient time for the captain to perceive and react to the effect of the downdraft and wind shear on the airplane's performance to stop the airplane's increased rate of descent and for the airplane to respond before striking the ground short of the runway. E.A.K.

N84-20501*# Battelle Columbus Labs., Ohio.
ADDRESSEE ERRORS IN ATC COMMUNICATIONS: THE CALL SIGN PROBLEM
William P. Monan Jan. 1983 34 p refs
(Contract NAS2-10060)
(NASA-CR-166462; NAS 1.26:166462) Avail: NTIS HC A03/MF A01 CSCL 01C

Communication errors involving aircraft call signs were portrayed in reports of 462 hazardous incidents voluntarily submitted to the ASRS during an approximate four-year period. These errors resulted in confusion, disorder, and uncoordinated traffic conditions and produced the following types of operational anomalies: altitude deviations, wrong-way headings, aborted takeoffs, go arounds, runway incursions, missed crossing altitude restrictions, descents toward high terrain, and traffic conflicts in flight and on the ground. Analysis of the report set resulted in identification of five categories of errors involving call signs: (1) faulty radio usage techniques, (2) call sign loss or smearing due to frequency congestion, (3) confusion resulting from similar sounding call signs, (4) airmen misses of call signs leading to failures to acknowledge or readback, and (5) controller failures regarding confirmation of acknowledgements or readbacks. These error categories are described in detail and several associated hazard mitigating measures that might be aken are considered. Author

N84-20502# National Transportation Safety Board, Washington, D. C.
AIRCRAFT ACCIDENT REPORT. WESTERN HELICOPTERS,

INC., BELL-UH-1B, N87701, VALENCIA, CALIFORNIA JULY 23, 1982
6 Mar. 1984 27 p
(PB84-910402; NTSB/AAR-84/02) Avail: NTIS HC A03/MF A01 CSCL 01C

On July 23, 1982, at 0220 Pacific daylight time, a Bell UH-1B, N87701, registered to Rocky Mountain Helicopter, Provo, Utah, and operated by Western Helicopters, Inc., Rialto, California, crashed during the filming of a movie at Indian Dunes, Valencia, California. The helicopter was being used in conjunction with the filming of a motion picture scene depicting a village typical of villages in Viet Nam which was under attack from heavy ordnance. The helicopter was used as a camera platform as well as playing an active role in the movie sequence. The helicopter was hovered about 25 feet above the village and nearly directly above the location where special effects explosives were detonated to simulate the heavy ordnance. As the pilot turned his helicopter to the left to provide camera coverage, the helicopter's tail section was engulfed in a fireball created by the detonation of a special effects explosion. The tail rotor assembly separated and the helicopter descended out of control. The helicopter's main rotor blade struck and fatally injured three actors on the ground. The six occupants on the helicopter sustained minor injuries, and the aircraft was damaged substantially. Author

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications.*

N84-20503# Ohio Univ., Athens. Dept. of Electrical and Computer Engineering.
ENGINEERING AND TECHNICAL SERVICES TO IMPROVE RELIABILITY AND MAINTAINABILITY OF INSTRUMENT LANDING SYSTEM COMPONENTS Final Report, Sep. 1981 - Apr. 1983
Joe D. Longworth, R. H. McFarland, Walter Thipps, Thierry dEstaintot, and M. Jamil Jan. 1983 293 p
(Contract DTFA01-81-C-20101)
(DOT/FAA/PM-84/7; OU/AEC/EER-62-1) Avail: NTIS HC A13/MF A01

Results of ILS anomaly investigation conducted at Buffalo, NY, Los Angeles, CA, International Falls, MN, and San Francisco, CA airports are documented. In addition, an anomalous performance of the FA5723 and FA8633 ILS clearance transmitter was investigated. Studies into the feasibility of ground check procedures for the capture effect glide slope systems and an investigation of maximum allowable audio harmonic content are also presented. Author

N84-20504*# Ohio Univ., Athens. Center for Avionics Engineering.
PROCESSOR-CONTROLLED TIMING MODULE FOR LORAN-C RECEIVER
Robert W. Lilley Feb. 1984 11 p refs
(Contract NGR-36-009-017)
(NASA-CR-175424; NAS 1.26:175424; TM-90) Avail: NTIS HC A02/MF A01 CSCL 17G

Hardware documentation is provided for the modified LORAN-C timing module, which uses direct software control in determining loop sample times. Computer loading is reduced by eliminating polled operation of the timing loop. Author

N84-20505*# National Aeronautics and Space Administration, Washington, D. C.
DEVELOPMENT OF A VOR/DME MODEL FOR AN ADVANCED CONCEPTS SIMULATOR
George G. Steinmetz and Roland L. Bowles Mar. 1984 33 p refs
(NASA-TM-85717; NAS 1.15:85717) Avail: NTIS HC A03/MF A01 CSCL 01D

The report presents a definition of a VOR/DME, airborne and ground systems simulation model. This description was drafted in response to a need in the creation of an advanced concepts simulation in which flight station design for the 1980 era can be postulated and examined. The simulation model described herein provides a reasonable representation of VOR/DME station in the continental United States including area coverage by type and noise errors. The detail in which the model has been cast provides the interested researcher with a moderate fidelity level simulator tool for conducting research and evaluation of navigator algorithms. Assumptions made within the development are listed and place certain responsibilities (data bases, communication with other simulation modules, uniform round earth, etc.) upon the researcher. Author

N84-20506*# Ohio Univ., Athens. Dept. of Electrical and Computer Engineering.
A MICRO-COMPUTER BASED SYSTEM TO COMPUTE MAGNETIC VARIATION
Rajan Kaul Mar. 1984 26 p
(Grant NGR-36-009-017)
(NASA-CR-173376; NAS 1.26:173376) Avail: NTIS HC A03/MF A01 CSCL 17G

A mathematical model of magnetic variation in the continental United States (COT48) was implemented in the Ohio University LORAN C receiver. The model is based on a least squares fit of a polynomial function. The implementation on the microprocessor based LORAN C receiver is possible with the help of a math chip, Am9511 which performs 32 bit floating point mathematical operations. A Peripheral Interface Adapter (M6520) is used to communicate between the 6502 based micro-computer and the 9511 math chip. The implementation provides magnetic variation data to the pilot as a function of latitude and longitude. The model and the real time implementation in the receiver are described. DOE

N84-20507# Eclectech Associates, Inc., North Stonington, Conn.
AIDS TO NAVIGATION RADAR 1 PRINCIPAL FINDINGS: PERFORMANCE IN LIMITED VISIBILITY OF SHORT RANGE AIDS WITH PASSIVE REFLECTORS Interim Report
J. Multer and M. W. Smith Dec. 1983 104 p
(Grant DOT-DG-835285-A)
(AD-A137596; EA-83-U-143; USCG-D-79-83) Avail: NTIS HC A06/MF A01 CSCL 17/7

This report describes an experiment conducted as a component of the United States Coast Guard's Performance of Aids to Navigation Project. The experiment evaluates the efficacy of floating aids (buoys) equipped with passive reflectors and the use of radar (3 cm) in a limited visibility. The following variables were evaluated: visibility (1-1/2 nm, 1/4 nm, zero nm); ship size (30,000 dwt versus 80,000 dwt); buoy arrangement in the turn and straight channel segment; wind and current. In addition, comparisons to previous experiments in this project were made to evaluate differences between piloting with radar in low visibility and piloting in adequate visibility without radar. Differences in performance were most evident in the turn region while differences in the tracekeeping regions were less noticeable. In the turn region, performance suffered more in the low visibility conditions with radar than in the adequate visibility conditions without radar. Performance in the radar piloting scenarios was also worse in the lowest visibility condition in the turn. Pilots performed better with a smaller ship and with aid arrangements having higher density spacing. Finally, style differences in the use of radar were found and related to differences in ship track performance. Author (GRA)

N84-20508# Coast Guard, Washington, D.C. Office of Research and Development.
LORAN-C SIGNAL STABILITY STUDY: NORTHEAST AND

SOUTHEAST U.S. Final Report, May 1981 - Aug. 1983
R. J. Wenzel and D. C. Slagle Aug. 1983 265 p
(AD-A137628; USCG-D-28-83) Avail: NTIS HC A12/MF A01 CSCL 17/7

The suitability of LORAN-C as a precision aid to navigation in the harbor-harbor entrance (HHE) areas of the continental U.S. involves an assessment of the stability of the signals of the existing LORAN-C system along with an examination of stability improvement methods. The final efforts were begun in early 1981 with the deployment of LORAN data collection sets (the so-called harbor monitors) in select harbor areas. In this report, the harbor monitor data collected at 14 sites located along the northeast U.S. and southeast U.S. (N.E.U.S./S.E.U.S.) coast is presented. Extensive analyses are conducted to obtain a model of the LORAN signal variations and extend the results to allow the determination of system performance throughout the region. The report shows the HHE level performance requirements can be met, at most with a moderate set of system improvements, in almost all major harbor areas. The effects of adverse system geometry, unfortunately, exclude the achievement of adequate performance in the major ports of the east coast of Texas. GRA

N84-20509# Transportation Systems Center, Cambridge, Mass.
SPECIFICATION OF THE TRANSMITTED SIGNAL OF THE OMEGA NAVIGATION SYSTEM Final Report, Jan. - Nov. 1982
Arthur OBrien and David C. Burnham Jan. 1984 25 p
(AD-A137673; DOT-TSC-CG-83-4; DOT-CG-N-2-82) Avail: NTIS HC A02/MF A01 CSCL 17/7

This report documents the specification of the transmitted signal to the OMEGA Navigation System. It is intended as a reference document consisting of specifications, definitions, and explanations for general use by designers, manufacturers, and users of this system. GRA

N84-20510# Aircraft Research and Development Unit, Edinburg (Australia).
EVALUATION OF INSTALLATION OF LIGHTWEIGHT DOPPLER NAVIGATION SYSTEM (LDNS) IN IROQUOIS UH-1H AIRCRAFT
L. R. Ward and K. W. McPherson Nov. 1983 74 p
(AD-A137815; ARDU-TI-760) Avail: NTIS HC A04/MF A01 CSCL 17/7

The purpose of this task was to evaluate the prototype installation of a K510A-009-01 Lightweight Doppler Navigation System (LDNS) in a UH-1H Iroquois helicopter for the utility helicopter transport and gunship missions. After initial shakedown flights at Bankstown, NWS a detailed evaluation of the installation was conducted in the Adelaide and Woomera, SA areas during the period 1 to 30 June 1982. Productive flight test time totalled 24.1 flight hours, including 2.9 at night. The installation of the LDNS will significantly increase the mission effectiveness and capabilities of the RAAF UH-1H Iroquois fleet by providing crews with accurate navigation data in a readily usable format. The range of navigation information was comprehensive and well suited to both tactical and Search and Rescue (SAR) operations. The LDNS also significantly increased the operational capability of the UH-1H by enhancing Night Vision Goggle operations. GRA

N84-20577*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MIXING 4D-EQUIPPED AND UNEQUIPPED AIRCRAFT IN THE TERMINAL AREA
L. Tobias, H. Erzberger, H. Q. Lee, and P. J. OBrien (FAA, Atlantic City, N.J.) *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 171-190 ref (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

N84-20578*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF FUEL/TIME MINIMIZATION TECHNIQUES TO ROUTE PLANNING AND TRAJECTORY OPTIMIZATION
Charles E. Knox *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 191-208 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

N84-20589*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLIGHT TEST RESULTS FOR THE DIGITAL INTEGRATED AUTOMATIC LANDING SYSTEMS (DIALS): A MODERN CONTROL FULL-STATE FEEDBACK DESIGN
R. M. Hueschen *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 411-428 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-20511 Purdue Univ., Lafayette, Ind.
COOPERATIVE PILOT-OPTIMAL AUGMENTATION SYSTEM SYNTHESIS FOR COMPLEX FLIGHT VEHICLES Ph.D. Thesis
Mario Innocenti 1983 305 p
Avail: Univ. Microfilms Order No. DA8400370

Development of control configured flight vehicles has introduced challenging problems in both the areas of control system design and handling qualities specifications. Standard design techniques based on open loop criteria and a posterior handling qualities verification for pilot's acceptability have proved to be often inadequate when applied to the above vehicles because of the lack of information and unprecendented properties of their behavior. A control system design approach for optimal stability augmentation systems using limited state feedback theory, with the specific inclusion of the human pilot in the loop is proposed. The methodology is intended to be especially suitable for application to flight vehicles exhibiting nonconventional dynamics characteristics and for which quantitative handling qualities specifications might not be available. Dissert Abstr.

N84-20512*# Integrated Systems, Inc., Palo Alto, Calif.
REAL-TIME FLUTTER ANALYSIS Final Report
Robert Walker and Naren Gupta Mar. 1984 126 p
(Contract NAS4-2955)
(NASA-CR-170412; NAS 1.26:170412; ISI-24) Avail: NTIS HC A07/MF A01 CSCL 01C

The important algorithm issues necessary to achieve a real time flutter monitoring system; namely, the guidelines for choosing appropriate model forms, reduction of the parameter convergence transient, handling multiple modes, the effect of over parameterization, and estimate accuracy predictions, both online and for experiment design are addressed. An approach for efficiently computing continuous-time flutter parameter Cramer-Rao estimate error bounds were developed. This enables a convincing comparison of theoretical and simulation results, as well as offline studies in preparation for a flight test. Theoretical predictions, simulation and flight test results from the NASA Drones for Aerodynamic and Structural Test (DAST) Program are compared. Author

N84-20513# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HELICOPTER FATIGUE DESIGN GUIDE
F. Liard, ed. Nov. 1983 291 p
(AD-A138963; AGARD-AG-292; ISBN-92-835-0341-4) Avail: NTIS HC A13/MF A01 CSCL 01/3

Fatigue problems about affecting helicopters are considered. Documents the experience of helicopter manufacturing member nations of NATO are reviewed. It is aimed expecially at design and test facilities who manufacture rotary wing aircrafts. Information

on determination of fatigue strength and behavior is presented.
E.A.K.

N84-20514*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
EVALUATION OF A FLOW DIRECTION PROBE AND A PITOT-STATIC PROBE ON THE F-14 AIRPLANE AT HIGH ANGLES OF ATTACK AND SIDESLIP
Terry J. Larson Mar. 1984 42 p refs Prepared in cooperation with NASA. Ames Research Center, Moffett Field, Calif.
(NASA-TM-84911; H-1189; NAS 1.15:84911) Avail: NTIS HC A03/MF A01 CSCL 01C

The measurement performance of a hemispherical flow-angularity probe and a fuselage-mounted pitot-static probe was evaluated at high flow angles as part of a test program on an F-14 airplane. These evaluations were performed using a calibrated pitot-static noseboom equipped with vanes for reference flow direction measurements, and another probe incorporating vanes but mounted on a pod under the fuselage nose. Data are presented for angles of attack up to 63, angles of sideslip from -22 deg to 22 deg, and for Mach numbers from approximately 0.3 to 1.3. During maneuvering flight, the hemispherical flow-angularity probe exhibited flow angle errors that exceeded 2 deg. Pressure measurements with the pitot-static probe resulted in very inaccurate data above a Mach number of 0.87 and exhibited large sensitivities with flow angle.
S.L.

N84-20515*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A REVIEW OF RECENT DEVELOPMENTS IN FLIGHT TEST TECHNIQUES AT THE AMES RESEARCH CENTER, DRYDEN FLIGHT RESEARCH FACILITY
Garrison P. Layton Apr. 1984 17 p refs Presented at the Canadian Aeronautics and Space Inst. (CASI) Flight Test Symp., Cold Lake, Alberta, 11-12 Apr. 1984
(NASA-TM-86039; H-1237; NAS 1.15:86039) Avail: NTIS HC A02/MF A01 CSCL 01C

New flight test techniques in use at Ames Dryden are reviewed. The use of the pilot in combination with ground and airborne computational capabilities to maximize data return is discussed, including the remotely piloted research vehicle technique for high-risk testing, the remotely augmented vehicle technique for handling qualities research, and use of ground computed flight director information to fly unique profiles such as constant Reynolds number profiles through the transonic flight regime. Techniques used for checkout and design verification of systems-oriented aircraft are discussed, including descriptions of the various simulations, iron bird setups, and vehicle tests. Some newly developed techniques to support the aeronautical research disciplines are discussed, including a new approach to position-error determination, and the use of a large skin friction balance for the measurement of drag caused by various excrescencies. Author

N84-20516# Systems Research Labs., Inc., Dayton, Ohio.
ELECTROLUMINESCENT FORMATION LIGHTS FOR HC-130 P/N SPECIAL OPERATIONS. 1: FLIGHT TEST CANDIDATES Technical Progress Report, 1 Jan. - 30 May 1983
John C. Simons and Jeffrey L. Craig (AMRL) Wright-Patterson AFB, Ohio AMRL Sep. 1983 39 p
(Contract F33615-83-C-0511; AF Proj. 7184)
(AD-A137662; AFAMRL-TR-83-069) Avail: NTIS HC A03/MF A01 CSCL 01/3

This report proposes two electroluminescent lighting candidates for HC-130 P/N special night formation operations. Following interviews with selected Air Force Air Rescue pilots on how they conduct low-level daylight operations, an analysis of critical mission factors and aircraft positions was completed. Based on their comments and a previous A-10 configuration flown by AFFWC, simulated EL lights made of paper were added to a C-130 as possible T&E candidates. Interviews were then conducted with HC-130 and HH-53 pilots as they observed the papered aircraft from several positions on the flight ramp. A final selection of two candidate EL configurations was based on ramp interviews and interviews of pilots observing a scaled aircraft and a model of the HC-130 in a darkened room. A forced-choice methodology based on switching between candidates at various formation positions was proposed for the flight test.
Author (GRA)

N84-20517# Vought Corp., Dallas, Tex.
CREW SURVIVABLE HELICOPTER UNDERCARRIAGE Final Report, Jul. 1982 - Oct. 1983
B. T. Gannon, J. L. Maris, and P. S. Waldrop Jan. 1984 62 p
(Contract DAAG46-82-C-0047)
(AD-A137770; AMMRC-TR-84-1) Avail: NTIS HC A04/MF A01 CSCL 01/3

The program goal was to demonstrate the energy absorbing capability of the Vought rotated sine wave concept for helicopter fuselage under-carriage structure. Specific program objectives were to develop design and manufacturing procedures for energy absorbing aluminum structure, fabricate and test specimens to confirm the methods and relate the slow and high rate test results to undercarriage structure designed tc meet MIL-STD-1290 criteria. The specimens were fabricated in a standard sheet metal shop, without special attention. There are several cost and weight advantages associated with the sine wave concept. The cost savings relative to conventional metal design are attributable to the reduction in number of parts and fasteners which saves material dollars and assembly hours. The high-rate and slow-rate testing of the test elements verified the performance of the energy absorbing structure developed in this program. The selected skin gage to meet the 200 lbs/in. running load requirement is 0.063 inch. The substructure will carry normal flight loads and provide the energy absorbing capability when necessary.
Author (GRA)

N84-20518# Aeronautical Research Labs., Melbourne (Australia).
RETRACTION AND LOWERING OF THE MIRAGE UNDERCARRIAGE
S. R. Sarrailhe and B. Quinn Sep. 1983 17 p
(AD-A137791; ARL/STRUC-TM-365) Avail: NTIS HC A02/MF A01 CSCL 01/3

The retraction and lowering process on the aircraft and operation of the jacks were investigated in the laboratory following a failure to lock down. Hydraulic system pressures were measured but no faults were found. It was considered that mechanical malfunction of the internal lock was the probable cause of failure.
GRA

N84-20519# San Antonio Air Logistics Center, Kelly AFB., Tex. Directorate of Materiel Management.
FUEL SYSTEM O-RING LEAKS ON POST P.D.M. (PROGRAMMED DEPOT MAINTENANCE) C-5A AIRCRAFT Final Technical Report, May - Sep. 1983
Carmine J. Forzono Sep. 1983 38 p
(AD-A137885; SAALC/MM-8149) Avail: NTIS HC A03/MF A01 CSCL 11/1

This report presents the data developed and gathered as a result of fuel leaks around O-rings found in C-5 fuel systems following long periods of Programmed Depot Maintenance (PDM). The O-ring leaks occurred when the fuel system was refilled after having been empty for 60-90 days during PDM. The study also involved an investigation of Buna-N O-ring shrinkage and swelling characteristics along with some testing of less or no shrinkage O-ring materials like the phosphonitrilic fluoride (PNF) O-ring.
Author (GRA)

N84-20575*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
PRACTICAL ASPECTS OF MODELING AIRCRAFT DYNAMICS FROM FLIGHT DATA
Kenneth W. Iliff and Richard E. Maine *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 135-154 Prepared in cooperation with NASA. Ames Research Center (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

N84-20576*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATIONS OF MODEL STRUCTURE DETERMINATION TO FLIGHT TEST DATA
James G. Batterson and Vladislav Klein (George Washington Univ., Hampton, Va.) *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 155-170 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

N84-20579*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FEEDBACK LAWS FOR FUEL MINIMIZATION FOR TRANSPORT AIRCRAFT
Douglas B. Price and Christopher Gracey *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 209-219 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

N84-20594*# Douglas Aircraft Co., Inc., Long Beach, Calif.
RESEARCH OPPORTUNITIES FOR FUTURE COMMERCIAL TRANSPORTS
J. F. Longshore *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 511-517 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

N84-20596*# Boeing Vertol Co., Philadelphia, Pa.
RESEARCH OPPORTUNITIES FOR ROTORCRAFT
Bruce B. Blake *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 537-548 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

N84-20598*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MILITARY AIRCRAFT RESEARCH OPPORTUNITIES FOR THE FUTURE
Robert C. Schwanz *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 559-569 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography.*

N84-20520*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN AUTOMATED STALL-SPEED WARNING SYSTEM
Douglass O. Wilner and Glenn A. Bever Feb. 1984 17 p refs Presented at the AIAA 2nd Flight Test Conf., Las Vegas, Nev., 16-18 Nov. 1983 Revised Sponsored in part by Army Aviation Engineering Flight Activity
(NASA-TM-84917; H-1209; NAS 1.15:84917; AIAA-83-2705-Rev) Avail: NTIS HC A02/MF A01 CSCL 01D

The development and testing of a stall-speed warning system for the OV-1C was examined. NASA designed and built an automated stall-speed warning system which presents both airspeed and stall speed to the pilot. The airspeed and stall speed are computed in real time by monitoring the basic aerodynamic parameters (dynamic pressure, horizontal and vertical accelerations, and pressure altitude) and other parameters (elevator and flap positions, engine torques, and fuel flow). In addition, an aural warning at predetermined stall margins is presented to the pilot through a voice synthesizer. Once the system was designed and installed in the aircraft, a flight-test program of less than 20 hrs was anticipated to determine the stall-speed software coefficients. These coefficients would then be inserted in the system's software and then test flown over a period of about 10 hr for the purpose of evaluation. M.A.C.

N84-20521*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE DEVELOPMENT OF AN AIRBORNE INSTRUMENTATION COMPUTER SYSTEM FOR FLIGHT TEST Final Report
Glenn A. Bever Apr. 1984 16 p refs Presented at the AGARD Flight Mech. Panel Symp. on Flight Test Tech., Lisbon, 2-5 Apr. 1984
(NASA-TM-86036; H-1233; NAS 1.15:86036) Avail: NTIS HC A02/MF A01 CSCL 01D

Instrumentation interfacing frequently requires the linking of intelligent systems together, as well as requiring the link itself to be intelligent. The airborne instrumentation computer system (AICS) was developed to address this requirement. Its small size, approximately 254 by 133 by 140 mm (10 by 51/4 by 51/2 in), standard bus, and modular board configuration give it the ability to solve instrumentation interfacing and computation problems without forcing a redesign of the entire unit. This system has been used on the F-15 aircraft digital electronic engine control (DEEC) and its follow on engine model derivative (EMD) project and in an OV-1C Mohawk aircraft stall speed warning system. The AICS is presently undergoing configuration for use on an F-104 pace aircraft and on the advanced fighter technology integration (AFTI) F-111 aircraft. Author

N84-20522*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
AIRCRAFT CONTROL POSITION INDICATOR Patent Application
Dale V. Dennis, inventor (to NASA) Filed 8 Feb. 1984 15 p
(NASA-Case-LAR-12984-1; US-Patent-Appl-SN-578387) Avail: NTIS HC A02/MF A01 CSCL 01D

An aircraft control position indicator was provided that displayed the degree of deflection of the primary flight control surfaces and the manner in which the aircraft responded. The display included a vertical elevator dot/bar graph meter display for indicating whether the aircraft will pitch up or down, a horizontal aileron dot/bar graph meter display for indicating whether the aircraft will roll to the left or the right, and a horizontal rudder dot/bar graph meter display for indicating whether the aircraft will turn left or right. The vertical and horizontal display or displays intersect to form an up/down, left/right type display. Internal electronic display driver means received signals from transducers measuring the control surface deflections and determined the position of the meter indicators on each dot/bar graph meter display. The device allows readability at a glance, easy visual perception in sunlight or shade, near-zero lag in displaying flight control position, and is not affected by gravitational or centrifugal forces. NASA

N84-20523# Army Aviation Research and Development Command, St. Louis, Mo. Developmental Systems Analysis Div.
EVALUATION OF AUTOMATIC TEST EQUIPMENT FOR USE WITH THE ARMY HELICOPTER IMPROVEMENT PROGRAM Final Technical Report
Margaret A. Szuba Aug. 1983 109 p
(AD-A137647; USAAVRADCOM-TM-83-F-5) Avail: NTIS HC A06/MF A01 CSCL 15/5

This report documents an analysis of Automatic Test Equipment (ATE) for use with the Army Helicopter Improvement Program (AHIP) aircraft system. The study addresses the Test Support System (TSS) versus spares and the MSM-105(V)2. The MSM-105(V)2 is the 410(V)4 modified for van installation. For five different alternatives, this study compares the 20 year peacetime cost of repairing AHIP avionics. The alternatives include the use of spares at AVIM with ATE at Depot or the location of ATE at both AVIM and Depot. The analysis suggests that it would be more cost effective to locate the TSS at AVIM and Depot than to place the MSM-105(V)2 and/or spares at these same levels. Table 3.1 displays the results of the analysis for each alternative. Final figures are shown for the grand total cost and the total provisioning cost. GRA

N84-20818# Naval Air Test Center, Patuxent River, Md.
UTILIZATION OF DOUBLE INTEGRATION METHODOLOGY TO DETERMINE AN AIRCRAFT'S VERTICAL DISPLACEMENT
Terry A. Collom *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 173-189 (For primary document see N84-20809 11-35)
(AD-P002681) Avail: NTIS HC A99/MF A01 CSCL 01/4

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-20524*# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
THE INFLUENCE OF GYROSCOPIC FORCES ON THE DYNAMIC BEHAVIOR AND FLUTTER OF ROTATING BLADES Final Technical Report, 1 Jun. 1980 - 31 Aug. 1983
F. Sisto and A. T. Chang Dec. 1983 118 p refs
(Grant NAG3-47)
(NASA-CR-175444; NAS 1.26:175444; ME-RT-82006) Avail: NTIS HC A06/MF A01 CSCL 21E

The structural dynamics of a cantilever turbomachine blade mounted on a spinning and precessing rotor are investigated. Both stability and forced vibration are considered with a blade model that increases in complexity (and verisimilitude) from a spring-restrained point mass, to a uniform cantilever, to a twisted uniform cantilever turbomachine blade mounted on a spinning and precessing rotor are investigated. Both stability and forced vibration are considered with a blade model that increases in complexity (and verisimilitude) from a spring-restrained point mass, to a uniform cantilever, to a twisted uniform cantilever, to a tapered twisted cantilever of arbitrary cross-section. In every instance the formulation is from first principles using a finite element based on beam theory. Both ramp-type and periodic-type precessional angular displacements are considered. In concluding, forced vibrating and flutter are studied using the final and most sophisticated structural model. The analysis of stability is presented and a number of numerical examples are worked out. S.L.

N84-20525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTION FUNDAMENTALS RESEARCH
Washington Apr. 1984 303 p refs Conf. held in Cleveland, 16-18 Apr. 1984
(NASA-CP-2309; E-2062; NAS 1.55:2309) Avail: NTIS HC A14/MF A01 CSCL 21E

The various physical processes that occur in the gas turbine combustor and the development of analytical models that accurately describe these processes are discussed. Aspects covered include fuel sprays; fluid mixing; combustion dynamics; radiation and chemistry and numeric techniques which can be applied to highly turbulent, recirculating, reacting flow fields. For individual titles, see N84-20526 through N84-20561.

N84-20526*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
MEASUREMENTS IN LIQUID FUEL SPRAYS **c34**
Norman Chigier *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 1-15 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

Techniques for studying the events directly preceding combustion in the liquid fuel sprays are being used to provide information as a function of space and time on droplet size, shape, number density, position, angle of flight and velocity. Spray chambers were designed and constructed for: (1) air-assist liquid fuel research sprays; (2) high pressure and temperature chamber for pulsed diesel fuel sprays; and (3) coal-water slurry sprays. Recent results utilizing photography, cinematography, and calibration of the Malvern particle sizer are reported. Systems for simultaneous measurement of velocity and particle size distributions using laser Doppler anemometry interferometry and the application of holography in liquid fuel sprays are being calibrated. A.R.H.

N84-20527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL SPRAY DIAGNOSTICS **c34**
Maria A. Bosque *In its* Combust. Fundamentals Res. Apr. 1984 p 17-21 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

Several laser measurement methods are being studied to provide the capability to make droplet size and velocity measurements under a variety of spray conditions. The droplet sizing interferometer (DSI) promises to be a successful technique because of its capability for rapid data acquisition, compilation and analysis. Its main advantage is the ability to obtain size and velocity measurements in air-fuel mixing studies and hot flows. The existing DSI at NASA Lewis is a two-color, two-component system. Two independent orthogonal measurements of size and velocity components can be made simultaneously. It also uses an off-axis large-angle light scatter detection. The fundamental features of the system are optics, signal processing and data management system. The major component includes a transmitter unit, two receiver units, two signal processors, two data management systems, two Bragg cell systems, two printer/plotters, a laser, power supply and color monitor. A.R.H.

N84-20528*# Spectron Development Labs., Inc., Costa Mesa, Calif.
DEVELOPMENT AND IMPLEMENTATION OF ADVANCED DIAGNOSTIC TECHNIQUES **c35**
Cecil F. Hess *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 23-29 (For primary document see N84-20525 11-07)
(Contract NAS3-23538)
Avail: NTIS HC A14/MF A01 CSCL 14B

Two techniques were identified which offer great potential in the measurement of sprays. The first is referred to as IMAX, and it consists of a nonintrusive pulse height analyzer. The second is referred to as Visibility/Intensity (V/I) and it performs a size measurement by examining the visibility and the pedestal intensity that the IMAX technique provides a larger dynamic range and higher accuracy than V/I. It also shows that the two-color IMAX concept provides a higher S/N primarily because of the high efficiency in spectrally separating the two signals. The size distribution of two kinds of sprays are reported. The first spray was produced by a Berglund-Liu droplet generator with dispersion air. The second spray was produced by a pressure nozzle. A.R.H.

N84-20529*# Aerometrics, Inc., Mountain View, Calif.
ANALYSIS AND TESTING OF A NEW METHOD FOR DROP SIZE AND VELOCITY MEASUREMENTS USING LASER LIGHT SCATTER INTERFEROMETRY **c36**
W. D. Bachalo *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 31-45 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20E

Drop size and velocity can be measured simultaneously using an optical system which is the same as a laser Doppler velocimeter except that three detectors are located at selected spacings behind the receiver aperture. Drops passing through the intersection of the two beams scatter light which produces an interferrence fringe pattern. The temporal frequency of the fringe pattern is the Doppler difference frequency which is linearly proportional to the drop velocity while the spatial frequency is linearly related to the drop diameter. The spacing of the fringes is also dependent upon the light wavelength, beam intersection angle, drop refractive index (unless reflected light is measured), and the location of the receiver.

The theoretical analysis was verified, signal phase processing methods were evaluated, and the effects of signal quality upon the measurements were investigated. A.R.H.

N84-20530*# Tennessee Univ. Space Inst., Tullahoma. Applied Physics Research Group.
MEASUREMENT OF SPRAY COMBUSTION PROCESSES c25
C. E. Peters, E. F. Arman, J. O. Hornkohl, and W. M. Farmer *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 47-50 refs (For primary document see N84-20525 11-07)
(Grant NAG3-370)
Avail: NTIS HC A14/MF A01 CSCL 21B

A free jet configuration was chosen for measuring noncombusting spray fields and hydrocarbon-air spray flames in an effort to develop computational models of the dynamic interaction between droplets and the gas phase and to verify and refine numerical models of the entire spray combustion process. The development of a spray combustion facility is described including techniques for laser measurements in spray combustion environments and methods for data acquisition, processing, displaying, and interpretation. A.R.H.

N84-20531*# Aerodyne Research, Inc., Bedford, Mass. Center for Chemical and Environmental Physics.
AUTOMATIC HOLOGRAPHIC DROPLET ANALYSIS FOR LIQUID FUEL SPRAYS c34
Alan C. Stanton, Gerald W. Stewart, and H. John Caulfield *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 51-54 refs (For primary document see N84-20525 11-07)
(Contract NAS3-24094)
Avail: NTIS HC A14/MF A01 CSCL 20D

The basic scheme for automated holographic analysis involves an optical system for reconstruction of the three dimensional real image of the droplet field, a spatial scanning system to transport a digitizing X-y image sensor through the real image, and processing algorithms for droplet recognition which establish the droplet sizes and positions. The hardware for system demonstrated includes the expanded and collimated beam from a 5 mW helium-neon laser for hologram reconstruction, an imaging lens for magnification of the real image field, and a video camera and digitizer providing 512-by-512 pixel resolution with 8-bit digitization. A mechanical stage is used to scan the hologram in three dimensional space, maintaining constant image magnification. A test droplet hologram is used for development and testing of the image processing algorithms. A.R.H.

N84-20532*# Pennsylvania State Univ., University Park.
PREDICTIONS OF SPRAY COMBUSTION INTERACTIONS c25
J.-S. Shuen, A. S. P. Solomon, and G. M. Faeth *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 55-66 refs (For primary document see N84-20525 11-07)
(Grant NAG3-190)
Avail: NTIS HC A14/MF A01 CSCL 21B

Mean and fluctuating phase velocities; mean particle mass flux; particle size; and mean gas-phase Reynolds stress, composition and temperature were measured in stationary, turbulent, axisymmetric, and flows which conform to the boundary layer approximations while having well-defined initial and boundary conditions in dilute particle-laden jets, nonevaporating sprays, and evaporating sprays injected into a still air environment. Three models of the processes, typical of current practice, were evaluated. The local homogeneous flow and deterministic separated flow models did not provide very satisfactory predictions over the present data base. In contrast, the stochastic separated flow model generally provided good predictions and appears to be an attractive approach for treating nonlinear interphase transport processes in turbulent flows containing particles (drops). A.R.H.

N84-20533*# California Univ., Irvine. Dept. of Mechanical Engineering.
EFFECT OF LIQUID DROPLETS ON TURBULENCE STRUCTURE IN A ROUND GASEOUS JET c34
A. M. Mostafa and S. E. Elghobashi *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 67-75 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

A proposed two equation turbulence model for incompressible dilute two phase flows was validated and extended for steady incompressible two phase flow including phase change. The model was tested for the flow of a turbulent axisymmetric gaseous jet laden with multisize evaporating liquid droplets. Predicted results include distributions of the mean velocity; volume fractions of different phases concentration of the evaporated material in the carrier phase; turbulence intensity and shear stress of the carrier phase; droplet diameter distribution; and the jet spreading rate. Results are analyzed based on a qualitative comparison with the corresponding single phase jet flow. A.R.H.

N84-20534*# Drexel Univ., Philadelphia, Pa.
COMBUSTION CHARACTERISTICS IN THE TRANSITION REGION OF LIQUID FUEL SPRAYS c25
Nicholas P. Cernansky, Izak Namer, Robert J. Tidona, and Hamid Sarv *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 77-80 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

A monodisperse aerosol generator was modified to study ignition requirements, flammability limits, and flame speeds in the transition region. An ignition system was developed and tested. The fabrication of an optical drop sizing system is nearly complete. Preliminary measurements of droplet size effects on the minimum ignition energy for n-heptane sprays performed. Parameteric studies of droplet size effects on minimum ignition energies of various fuels including alcohols are in progress. A.R.H.

N84-20535*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
TURBULENT SWIRLING COMBUSTION c25
Holger T. Sommer, Raymond J. Mosula, and Ellice Seiden *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 81-82 refs (For primary document see N84-20525 11-07)
(Contract NAG3-401)
Avail: NTIS HC A14/MF A01 CSCL 21B

The non-reacting flow produced by two confined, co- and/or counter-swirling jets wre measured by means of a two-color laser Doppler velocimeter. These results are compared with earlier experiments and with numerical predictions. It is shown that under both swirl conditions, a closed recirculation zone is created at the combustor center line. This zone is characterized by the presence of a one-cell toroidal vortex, low tangential velocities, high turbulent intensity, and large dissipation rates of the kinetic energy of turbulence. A.R.H.

N84-20536*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Engineering Div.
ERROR REDUCTION PROGRAM: A PROGRESS REPORT
Sasdat A. Syed *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 83-95 refs (For primary document see N84-20525 11-07)
(Contract NAS3-23686)
Avail: NTIS HC A14/MF A01 CSCL 21E

Five finite differences schemes were evaluated for minimum numerical diffusion in an effort to identify and incorporate the best error reduction scheme into a 3D combustor performance code. Based on this evaluated, two finite volume method schemes were selected for further study. Both the quadratic upstream differencing scheme (QUDS) and the bounded skew upstream differencing scheme two (BSUDS2) were coded into a two dimensional computer code and their accuracy and stability determined by running several test cases. It was found that BSUDS2 was more stable than QUDS. It was also found that the accuracy of both schemes is dependent on the angle that the streamline make with the mesh with QUDS being more accurate

at smaller angles and BSUDS2 more accurate at larger angles. The BSUDS2 scheme was selected for extension into three dimensions. A.R.H.

N84-20537*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF IMPROVED NUMERICAL SCHEMES c64
G. H. Neely *In its* Combust. Fundamentals Res. Apr. 1984 p 95-96 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 12A

Two approaches which accelerate the solution of the steady state Navier-Stokes equations are discussed. The SIMPLER algorithm, a revised version of SIMPLE, provides a more accurate pressure field for each iteration through the momentum equations, thereby speeding convergence. PISO (Pressure Implicit Split Operator), performs a secondary correction of the velocity and pressure fields (after the typical pressure correction) which enhances convergence. Both schemes account for terms neglected in the SIMPLE approach, but do so in slightly different ways. Two dimensional driven cavity flow and flow over a step were calculated to examine the effect of geometry on the performance of these schemes. Computations were carried out on a series of progressively finer grids. The effect of relaxation number on convergence rate was analyzed, using results from SIMPLE as criteria for performance correlation. Results show: (1) the improved schemes promoted convergence by up to 60% for the driven cavity and 40% for flow over a step; (2) for the driven cavity problem, the efficiency of PISO and SIMPLER increased as the number of nodes increased; and (3) to ensure faster convergence, higher relaxation numbers must be applied. A.R.H.

N84-20538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL MODELING OF TURBULENT FLOW c34
R. W. Claus *In its* Combust. Fundamentals Res. Apr. 1984 p 97 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

Three dimensional combustor calculations are currently stretching the computer hardware capabilities and the computing budgets of gas turbine manufacturers. One of the main reasons for this relates to the large number of complex physical processes occurring in the combustor. Airflow, fuel spray, reaction kinetics, flame radiation, and not the least of which, turbulence must be modeled and the related differential equations solved. Discussions in this conference will address methods to improve the accuracy of combustor flow field calculations and methods to speed the convergence of the modeled equations. This report will focus on aspects of merging these two new technologies. The improved accuracy discretization schemes have a negative impact on the speed of convergence of the modeled equations that the improved solution algorithms may not overcome. A description of the causes of this problem and potential solutions will be examined. B.W.

N84-20539*# Argonne National Lab., Ill.
ADVANCED NUMERICS FOR MULTI-DIMENSIONAL FLUID FLOW CALCULATIONS c34
S. P. Vanka *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 99-102 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

In recent years, there has been a growing interest in the development and use of mathematical models for the simulation of fluid flow, heat transfer and combustion processes in engineering equipment. The equations representing the multi-dimensional transport of mass, momenta and species are numerically solved by finite-difference or finite-element techniques. However despite the multiude of differencing schemes and solution algorithms, and the advancement of computing power, the calculation of multi-dimensional flows, especially three-dimensional flows, remains a mammoth task. The following discussion is concerned with the author's recent work on the construction of accurate discretization schemes for the partial derivatives, and the efficient solution of the set of nonlinear algebraic equations resulting after discretization. The present work has been jointly supported by the Ramjet Engine Division of the Wright Patterson Air Force Base, Ohio, and the NASA Lewis Research Center. Author

N84-20540*# Toledo Univ., Ohio.
GRID FLEXIBILITY AND PATCHING TECHNIQUES c64
T. G. Keith, L. W. Smith, C. N. Yung, S. H. Barthelson, and K. J. DeWitt *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 103-114 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 12A

The numerical determination of combustor flowfields is of great value to the combustor designer. An a priori knowledge of the flow behavior can speed the combustor design process and reduce the number of experimental test rigs required to arrive at an optimal design. Even 2-D steady incompressible isothermal flow predictions are of use; many codes of this kind are available, each employing different techniques to surmount the difficulties arising from the nonlinearity of the governing equations and from typically irregular combustor geometries. Mapping techniques (algebraic and elliptic PDE), and adaptive grid methods (both multi-grid and grid embedding) as applied to axisymmetric combustors are discussed. B.W.

N84-20541*# United Technologies Research Center, East Hartford, Conn.
MASS AND MOMENTUM TRANSPORT EXPERIMENTS WITH SWIRLING FLOW c34
Bruce V. Johnson and Richard Roback *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 115-124 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

An experimental study of mixing downstream of axial and swirling coaxial jets is being conducted to obtain data for the evaluation and improvement of turbulent transport models currently employed in a variety of computational procedures used throughout the propulsion community. The axial coaxial jet study was completed under Phase 1. The swirling coaxial jet study, which is the subject of this paper, was conducted under Phase 2 of the contract. A TEACH code was acquired, checked out for several test cases, and is reported. A study to measure length scales and to obtain a limited number of measurements with a blunt trailing edge inlet is being conducted under Phase 3 of the contract. B.W.

N84-20542*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.
THE INFLUENCE OF LARGE-SCALE MOTION ON TURBULENT TRANSPORT FOR CONFINED COAXIAL JETS c34
David C. Brondum and John C. Bennett *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 125-129 refs (For primary document see N84-20525 11-07)
(Grant NAG3-350)
Avail: NTIS HC A14/MF A01 CSCL 20D

The existence of large-scale coherent structures in turbulent shear flows has been well documented in the literature. The importance of these structures in flow entrainment, momentum transport and mass transport in the shear layer has been suggested by several researchers. Comparisons between existing models and experimental data for shear flow in confined coaxial jets reinforce the necessity of further investigation of the large scale structures. These comparisons show the greatest discrepancy between prediction and actual results in the developing flow region where the large scales exist. It was also observed that the momentum transport rate comparisons were very bad. Finally, Schetz has reviewed mixing flows and concluded that large-scale structures were essential aspects of future modeling efforts. Author

N84-20543*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
VELOCITY VISUALIZATION IN GASEOUS FLOWS c34
R. K. Hanson, B. Hiller, C. Hassa, and R. A. Booman *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984

p 131-138 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

Techniques yielding simultaneous, multiple-point measurements of velocity in reacting or nonreacting flow fields have the potential to significantly impact basic and applied studies of fluid mechanics. This research program is aimed at investigating several candidate schemes which could provide such measurement capability. The concepts under study have in common the use of a laser source (to illuminate a column, a grid, a plane or a volume in the flow) and the collection of light at right angles (from Mie scattering, fluorescence, phosphorescence or chemiluminescence) using a multi-element solid-state camera (100 x 100 array of photodiodes). The work will include an overview and a status report of work in progress with particular emphasis on the method of Doppler-modulated absorption. B.W.

N84-20544*# Oklahoma State Univ., Stillwater.
INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES **c34**
David G. Lilley *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 139-151 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

Studies are concerned with experimental and theoretical research on 2-D axisymmetric geometries under low speed, nonreacting, turbulent, swirling flow conditions. The flow enters the test section and proceeds into a larger chamber (the linear expansion ratio D/d = 2, 1.5 and 1) via a sudden or gradual expansion (side wall angle alpha = 90 and 45 degrees). A weak or strong nozzle (of area ratio A/a = 2 and 4) may be positioned downstream at x/D = 2 to form a contraction exit to the test section. Inlet swirl vanes are adjustable to a variety of vane angles with values of theta = 0, 38, 45, 60 and 70 degrees being emphasized. The objective is to determine the effect of these parameters on isothermal flow field patterns, time mean velocities and turbulence quantities, and to establish an improved simulation in the form of a computer prediction code equipped with a suitable turbulence model. The goal of the on going research is to perform experiments and complementary computations with the idea of doing the necessary type of research that will yield improved calculation capability. This involves performing experiments where time mean turbulence quantities are measured and taking input conditions and running an existing prediction code for a variety of test cases so as to compare predictions against experiment. B.W.

N84-20545*# Case Western Reserve Univ., Cleveland, Ohio. Dept. of Mechanical and Aerospace Engineering.
DILUTION JET EXPERIMENTS IN COMPACT COMBUSTOR CONFIGURATIONS
Isaac Greber and James Zizelman *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 153-162 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21E

This project concerns the effects of cooling jets on the velocity and temperature fields in a compact reverse flow combustor. The work is motivated by the need to limit the temperatures of post combustion gases in jet engines to values within the endurance capabilities of turbine blades. The application requires not only that the temperature be kept sufficiently low but also that a suitably tailored temperature profile be provided at the combustor exit, with higher temperatures generally permissible at the blade tip than at the blade root because of higher centrifugal loads at the root. Flows in reverse flow combustor accelerate both longitudinally because of area changes and transversely because of flow turning. The current project started with flow visualization experiments in water, using aqueous solutions of zinc bromide to model the relatively higher density of cooling jets.
Author

N84-20546*# Michigan State Univ., East Lansing. Dept. of Mechanical Engineering.
FREE STREAM TURBULENCE AND DENSITY RATIO EFFECTS ON THE INTERACTION REGION OF A JET IN A CROSS FLOW **c34**
C. E. Wark and J. F. Foss *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 163-174 (For primary document see N84-20525 11-07)
(Grant NAG3-245)
Avail: NTIS HC A14/MF A01 CSCL 20D

Jets of low temperature air are introduced into the aft sections of gas turbine combustors for the purpose of cooling the high temperature gases and quenching the combustion reactions. Research studies, motivated by this complex flow field, have been executed by introducing a heated jet into the cross stream of a wind tunnel. The investigation by Kamotani and Greber stands as a prime example of such investigations and it serves as the principal reference for the present study. The low disturbance level of the cross stream, in their study and in similar research investigations, is compatible with an interest in identifying the basic features of this flow field. The influence of the prototypes' strongly disturbed cross flow is not, however, made apparent in these prior investigations. B.W.

N84-20547*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODELING OF DILUTION JET FLOWFIELDS **c34**
J. D. Holdeman and R. Srinivasan (Garrett Turbine Engine Co.) *In its* Combust. Fundamentals Res. Apr. 1984 p 175-187 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

The present paper will compare temperature field measurements from selected cases in these investigations with distributions calculated with an empirical model based on assumed vertical profile similarity and superposition and with a 3-D elliptic code using a standard K-E turbulence model. The results will show the capability (or lack thereof) of the models to predict the effects of the principle flow and geometric variables. Author

N84-20548*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
TURBULENCE CHARACTERISTICS OF AN AXISYMMETRIC REACTING FLOW **c34**
Richard D. Gould, Warren H. Stevenson, and H. Doyle Thompson *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 189-198 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21E

Turbulent sudden expansion flows are of significant theoretical and practical importance. Such flows have been the subject of extensive analytical and experimental study for decades, but many issues are still unresolved. Detailed information on reacting sudden expansion flows is very limited, since suitable measurement techniques have only been available in recent years. The present study of reacting flow in an axisymmetric sudden expansion was initiated under NASA support in December 1983. It is an extension of a reacting flow program which has been carried out with Air Force support under Contract F33615-81-K-2003. Since the present effort has just begun, results are not yet available. Therefore a brief overview of results from the Air Force program will be presented to indicate the basis for the work to be carried out.
Author

N84-20549*# Flow Research, Inc., Cambridge, Mass.
DIRECT NUMERICAL SIMULATION OF REACTING FLOWS **c34**
James J. Riley and Ralph W. Metcalfe *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 199-221 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

The objectives of this work are: (1) to extend the technique of direct numerical simulations to turbulent, chemically reacting flows, (2) to test the validity of the method by comparing computational results with laboratory data, and (3) to use the simulations to gain a better understanding of the effects of turbulence on chemical reactions. The effects of both the large scale structure and the smaller scale turbulence on the overall

reaction rates are addressed. The relationship between infinite reaction rate and finite reaction rate chemistry is compared with some of the results of calculations with existing theories and laboratory data. The direct numerical simulation method involves the numerical solution of the detailed evolution of the complex turbulent velocity and concentration fields. Using very efficient numerical methods (e.g., pseudospectral methods), the fully nonlinear (possibly low pass filtered) equations of motion are solved and no closure assumptions or turbulence models are used. Statistical data are obtained by performing spatial, temporal, and/or ensemble averages over the computed flow fields. B.W.

N84-20550*# Arizona State Univ., Tempe.
CHARACTERISTICS OF INHOMOGENEOUS JETS IN CONFINED SWIRLING AIR FLOWS **c34**
Ronald M. C. So and S. A. Ahmed *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 223-236 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

An experimental program to study the characteristics of inhomogeneous jets in confined swirling flows to obtain detailed and accurate data for the evaluation and improvement of turbulent transport modeling for combustor flows is discussed. The work was also motivated by the need to investigate and quantify the influence of confinement and swirl on the characteristics of inhomogeneous jets. The flow facility was constructed in a simple way which allows easy interchange of different swirlers and the freedom to vary the jet Reynolds number. The velocity measurements were taken with a one color, one component DISA Model 55L laser-Doppler anemometer employing the forward scatter mode. Standard statistical methods are used to evaluate the various moments of the signals to give the flow characteristics. The present work was directed at the understanding of the velocity field. Therefore, only velocity and turbulence data of the axial and circumferential components are reported for inhomogeneous jets in confined swirling air flows. R.J.F.

N84-20551*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
SATURATED LASER FLUORESCENCE IN TURBULENT SOOTING FLAMES AT HIGH PRESSURE **c36**
Galen B. King, Campbell D. Carter, and Normand M. Laurendeau *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 237-242 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20E

The primary objective was to develop a quantitative, single pulse, laser-saturated fluorescence (LSF) technique for measurement of radical species concentrations in practical flames. The species of immediate interest was the hydroxyl radical. Measurements were made in both turbulent premixed diffusion flames at pressures between 1 and 20 atm. Interferences from Mie scattering were assessed by doping with particles or by controlling soot loading through variation of equivalence ratio and fuel type. The efficacy of the LSF method at high pressure was addressed by comparing fluorescence and adsorption measurements in a premixed, laminar flat flame at 1-20 atm. Signal-averaging over many laser shots is sufficient to determine the local concentration of radical species in laminar flames. However, for turbulent flames, single pulse measurements are more appropriate since a statistically significant number of laser pulses is needed to determine the probability function (PDF). PDFs can be analyzed to give true average properties and true local kinetics in turbulent, chemically reactive flows. R.J.F.

N84-20552*# Northwestern Univ., Evanston, Ill.
LEAN LIMIT PHENOMENA **c25**
C. K. Law *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 243-249 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

The concept of flammability limits in the presence of flame interaction, and the existence of negative flame speeds are discussed. Downstream interaction between two counterflow premixed flames of different stoichiometries are experimentally studied. Various flame configurations are observed and quantified; these include the binary system of two lean or rich flames, the triplet system of a lean and a rich flame separated by a diffusion flame, and single diffusion flames with some degree of premixedness. Extinction limits are determined for methane/air and butane/air mixtures over the entire range of mixture concentrations. The results show that the extent of flame interaction depends on the separation distance between the flames which are functions of the mixtures' concentrations, the stretch rate, and the effective Lewis numbers (Le). In particular, in a positively-stretched flow field $Le < 1$ (> 1) mixtures tend to interact strongly (weakly), while the converse holds for flames in a negatively-stretched flow. Also established was the existence of negative flames whose propagation velocity is in the same general direction as that of the bulk convective flow, being supported by diffusion alone. Their existence demonstrates the tendency of flames to resist extinction, and further emphasizes the possibility of very lean or rich mixtures to undergo combustion. R.J.F.

N84-20553*# Washington Univ., Seattle.
INTERACTIVE COMPUTER MODELING OF COMBUSTION CHEMISTRY AND COALESCENCE-DISPERSION MODELING OF TURBULENT COMBUSTION **c25**
David T. Pratt *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 251-255 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

An interactive computer code for simulation of a high-intensity turbulent combustor as a single point inhomogeneous stirred reactor was developed from an existing batch processing computer code CDPSR. The interactive CDPSR code was used as a guide for interpretation and direction of DOE-sponsored companion experiments utilizing Xenon tracer with optical laser diagnostic techniques to experimentally determine the appropriate mixing frequency, and for validation of CDPSR as a mixing-chemistry model for a laboratory jet-stirred reactor. The coalescence-dispersion model for finite rate mixing was incorporated into an existing interactive code AVCO-MARK I, to enable simulation of a combustor as a modular array of stirred flow and plug flow elements, each having a prescribed finite mixing frequency, or axial distribution of mixing frequency, as appropriate. Further increase the speed and reliability of the batch kinetics integrator code CREKID was increased by rewriting in vectorized form for execution on a vector or parallel processor, and by incorporating numerical techniques which enhance execution speed by permitting specification of a very low accuracy tolerance. R.J.F.

N84-20554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FAST ALGORITHMS FOR COMBUSTION KINETICS CALCULATIONS: A COMPARISON **c25**
Krishnan Radhakrishnan (Michigan Univ.) *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 257-267 refs (For primary document see N84-20525 11-07) (Grants NAG3-147; NAG3-294)
Avail: NTIS HC A14/MF A01 CSCL 21B

To identify the fastest algorithm currently available for the numerical integration of chemical kinetic rate equations, several algorithms were examined. Findings to date are summarized. The algorithms examined include two general-purpose codes EPISODE and LSODE and three special-purpose (for chemical kinetic calculations) codes CHEMEQ, CRK1D, and GCKP84. In addition, an explicit Runge-Kutta-Merson differential equation solver (IMSL Routine DASCRU) is used to illustrate the problems associated with integrating chemical kinetic rate equations by a classical method. Algorithms were applied to two test problems drawn from combustion kinetics. These problems included all three combustion regimes: induction, heat release and equilibration. Variations of the temperature and species mole fraction are given with time for test problems 1 and 2, respectively. Both test problems were integrated over a time interval of 1 ms in order to obtain near-equilibration of all species and temperature. Of the codes

examined in this study, only CREK1D and GCDP84 were written explicitly for integrating exothermic, non-isothermal combustion rate equations. These therefore have built-in procedures for calculating the temperature. R.J.F.

N84-20555*# Princeton Univ., N. J.
THE ROLE OF SURFACE GENERATED RADICALS IN CATALYTIC COMBUSTION **c25**
D. A. Santavicca, Y. Stein, and B. S. H. Royce *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 269-274 refs (For primary document see N84-20525 11-07) (Grants NAG3-353; AF-AFOSR-6475)
Avail: NTIS HC A14/MF A01 CSCL 21B

The role of surface generated OH radicals in determining the catalytic ignition characteristics for propane oxidation on platinum were studied. The experiments were conducted in a stacked-plate, catalyst bed. Transient measurements, during catalytic ignition, of the catalyst's axial temperature profile were made and the effect of equivalence ratio, inlet temperature and inlet velocity was investigated. These measurements will provide insights which will be useful in planning and interpreting to OH measurements. Attempts to measure OH concentration in the catalyst bed using resonance absorption spectroscopy were unsuccessful, indicating that OH concentrations are below 10 to the 16th power/cc but still possibly above equilibrium values. Measurements are currently underway using forward scatter laser induced fluorescence which should extend the OH detection limits several orders of magnitude below the equilibrium concentrations. R.J.F.

N84-20556*# General Electric Co., Philadelphia, Pa. Aircraft Engine Business Group.
LINER ENVIRONMENT EFFECTS STUDY
K. S. Venkataramani and E. E. Ekstedt *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 275-284 ref (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21E

The Liner Environment Effects Study Program is aimed at establishing a broad heat transfer data base under controlled experimental conditions by quantifying the effects of the combustion system conditions on the combustor liner thermal loading and on the flame radiation characteristics. Five liner concepts spanning the spectrum of liner design technology from the very simple to the most advanced concepts are investigated. These concepts comprise an uncooled liner, a conventional film cooled liner, an impingement/film cooled liner, a laser drilled liner approaching the concept of a porous wall, and a siliconized silicon carbide ceramic liner. Effect of fuel type is covered by using fuels containing 11.8, 12.8, and 14% hydrogen. Tests at 100, 200, and 300 psia provide a basis for evaluating the effect of pressure on the heat transfer. The effects of the atomization quality and spray characteristics are examined by varying the fuel spray Sauter mean diameter and the spray angle. Additional varied parameters include reference velocity, a wide range of equivalence ratio, cooling flow rate, coolant temperature and the velocity of the coolant stream on the backside of the liner. R.J.F.

N84-20557*# Purdue Univ., Lafayette, Ind.
SPONTANEOUS IGNITION CHARACTERISTICS OF GASEOUS HYDROCARBON-AIR MIXTURES **c25**
G. Freeman and A. H. Lefebvre *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 285-296 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

Experiments are conducted to determine the spontaneous ignition delay times of gaseous propane, kerosine vapor, and n-heptane vapor in mixtures with air, and oxygen-enriched air, at atmospheric pressure. Over a range of equivalence ratios from 0.2 to 0.8 it is found that ignition delay times are sensibly independent of fuel concentration. However, the results indicate a strong dependence of delay times on oxygen concentration. The experimental data for kerosine and propane demonstrate very close agreement with the results obtained previously by Mullins and Lezberg respectively. Author

N84-20558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RANDOM VORTEX METHOD FOR COMBUSTING FLOWS **c25**
C. J. Marek *In its* Combust. Fundamentals Res. Apr. 1984 p 297-300 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

The random vortex method (RVM) of Chorin was developed by the recirculating flows. The RVM method models turbulence from first principles, tracking the vorticity and obtaining the interaction of vorticity with the bulk flow field. A computer program was produced called MIMOC, Modeling the Interface Motion of Combustion, which can be used to calculate the reacting flow field behind a rearward facing step. Several comparisons between experimental data and calculations were made. The RVM methood computes qualitatively good results, but the quantitative agreement as yet is not completely satisfactory. Much of the difficulty may be caused by the treatment of boundary conditions and the techniques used for obtaining statistical averages of velocities and turbulence quantities. For the rearward facing step the computed reattachment length equals the experimental value. However, the reverse velocity in the recirculation zone is over predicted by 300 percent. In the calculations, a uniform entrance velocity was assumed with no boundary layer at the step lip. This high velocity may be overdriving the reverse flow region. R.J.F.

N84-20559*# California Univ., Berkeley.
AERODYNAMIC FEATURES OF FLAMES IN PREMIXED GASES **c25**
A. K. Oppenheim *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 301-307 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

A variety of experimentally established flame phenomena in premixed gases are interpreted by relating them to basic aerodynamic properties of the flow field. On this basis the essential mechanism of some well known characteristic features of flames stabilized in the wake of a bluff-body or propagating in ducts are revealed. Elementary components of the flame propagation process are shown to be: rotary motion, self-advancement, and expansion. Their consequences are analyzed under a most strict set of idealizations that permit the flow field to be treated as potential in character, while the flame is modelled as a Stefan-like interface capable of exerting a feed-back effect upon the flow field. The results provide an insight into the fundamental fluid-mechanical reasons for the experimentally observed distortions of the flame front, rationalizing in particular its ability to sustain relatively high flow velocities at amazingly low normal burning speeds. R.J.F.

N84-20560*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT FLOW COMBUSTION **c25**
Robert R. Tacina *In its* Combust. Fundamentals Res. Apr. 1984 p 309-310 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

Non-steady combustion problems can result from engine sources such as accelerations, decelerations, nozzle adjustments, augmentor ignition, and air perturbations into and out of the compressor. Also non-steady combustion can be generated internally from combustion instability or self-induced oscillations. A premixed-prevaporized combustor would be particularly sensitive to flow transients because of its susceptability to flashback-autoignition and blowout. An experimental program, the Transient Flow Combustion Study is in progress to study the effects of air and fuel flow transients on a premixed-prevaporized combustor. Preliminary tests performed at an inlet air temperature of 600 K, a reference velocity of 30 m/s, and a pressure of 700 kPa. The airflow was reduced to 1/3 of its original value in a 40 ms ramp before flashback occurred. Ramping the airflow up has shown that blowout is more sensitive than flashback to flow transients. Blowout occurred with a 25 percent increase in airflow (at a constant fuel-air ratio) in a 20 ms ramp. Combustion resonance was found at some conditions and may be important in determining the effects of flow transients. R.J.F.

N84-20561*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTOR FLAME FLASHBACK c25
Margaret P. Proctor (Case Western Reserve Univ.), David N. Anderson, and James S. Tien (Case Western Reserve Univ.) *In its* Combust. Fundamentals Res. Apr. 1984 p 311-312 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

Flashback, a problem that occurs in premixed-prevaporized combustors, is the upstream propagation of the flame from the combustor into the premixing tubes. Not only does flashback change the combustion process from premixed burning to diffusion burning, thus creating more pollutants, but it also inflicts considerable damage to the fuel injector, premixing tube and other equipment upstream. The conditions at which flashback occurs in steady burning and the mechanism that causes flashback in both steady and transient flow are studied. The equivalence ratio at which flashback occurs is being measured for inlet temperatures of 600-950 K, premixer wall temperatures of 450-1050 K and premixer velocities of 40-80 ft/s. These data are presented. R.J.F.

N84-20562*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORMULATION OF BLADE-FLUTTER SPECTRAL ANALYSES IN STATIONARY REFERENCE FRAME
Anatole P. Kurkov Mar. 1984 32 p refs
(NASA-TP-2296; E-1888; NAS 1.60:2296) Avail: NTIS HC A03/MF A01 CSCL 21E

Analytic representations are developed for the discrete blade deflection and the continuous tip static pressure fields in a stationary reference frame. Considered are the sampling rates equal to the rotational frequency, equal to blade passing frequency, and for the pressure, equal to a multiple of the blade passing frequency. For the last two rates the expressions for determining the nodal diameters from the spectra are included. A procedure is presented for transforming the complete unsteady pressure field into a rotating frame of reference. The determination of the true flutter frequency by using two sensors is described. To illustrate their use, the developed procedures are used to interpret selected experimental results. Author

N84-20563# DyTec Engineering, Inc., Long Beach, Calif.
STUDY OF NOISE-CERTIFICATION STANDARDS FOR AIRCRAFT ENGINES. VOLUME 3: SELECTION AND EVALUATION OF ENGINE-NOISE-CERTIFICATION CONCEPT Final Report
A. H. Marsh, R. L. Chapkis, and G. L. Blankenship Dec. 1983 51 p
(Contract DOT-FA78WA-4096)
(AD-A137805; FAA/EE-82-11-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 21/5

The purpose of this 3-volume study was to consider the feasibility of establishing an FAA requirement for a manufacturer of aircraft engines to demonstrate compliance with an engine noise-level standard in order to obtain an engine-noise type certificate. The objective of engine-noise type certification (if feasible on the basis of economic reasonableness, technological practicality, and appropriateness to the type design) would be to supplement the aircraft-noise type certification requirements in Part 36 of the Federal Aviation Regulations. This study was limited to aircraft jet engines. Volume 3 describes the selection of a concept for the noise-evaluation quantity, namely the A-frequency-weighted sound power made nondimensional by a power-like quantity equal to the product of total net static thrust and the speed of sound in the ambient air. The recommended independent variable is total net static thrust made nondimensional by the product of total mass flow rate and the speed of sound in the ambient air. Farfield 1/3-octave-band sound pressure levels, measured around production and experimental versions of aircraft turbojet and turbofan engines, were used to test the utility and applicability of the recommended noise-evaluation quantity. Engines ranged in rated static thrust from 11 kN to 222 kN (2500 lb to 50,000 lb). For certification purposes, a certifying authority would select appropriate limits on the magnitude of the noise-evaluation quantity applicable to thrust settings representative of takeoff and landing approach. GRA

N84-20580*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDENTIFICATION OF MULTIVARIABLE HIGH-PERFORMANCE TURBOFAN ENGINE DYNAMICS FROM CLOSED LOOP DATA
Walter C. Merrill *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 221-238 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

N84-20590*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF ADVANCED CONTROL TECHNIQUES TO AIRCRAFT PROPULSION SYSTEMS
Bruce Lehtinen *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 429-442 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

N84-20600*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
PROPULSION CONTROL TECHNOLOGY
Edward C. Beattie *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 585-592 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N84-20564*# Systems Technology, Inc., Hawthorne, Calif.
HELISTAT SIMULATION STUDIES Final Report, Sep. 1979 - Nov. 1982
Mark B. Tischler and Irving L. Ashkenas Nov. 1982 86 p refs (Contract NAS2-10330)
(NASA-CR-166567; NAS 1.26:166567; STI-TR-1151-3) Avail: NTIS HC A05/MF A01 CSCL 01C

An analysis of the flight dynamics and piloted control characteristics of the Helistat, a quadrotor heavy-lift airship, was completed using the HYBRDS airship simulation facility. The analysis covered the full operating flight envelope, including likely ranges of altitude, airspeed, sideslip, and loading variations. Particular areas of study were performance, trim, power requirements, linearized dynamics, handling qualities, and mooring operations. The key assumptions were: a rigid vehicle, no control system dynamics, fixed rotor and propeller RPM, and no ballonet dynamics. The nominal cruise speed for the H34 engines operating at 1275 HP was found to be 40-50 kts, depending on the loading condition. The maximum payload capability was calculated as 45,000 lbs for sea level-based operations. The crosswind capability in hover is 5-10 kts depending on the loading conditions, but this requires excessive roll angle due to the roll-to-translate control gearing. Sideslip angles of 110-135 degrees (wind from aft quarters) are critical for directional trim and stability, and should be avoided. S.L.

N84-20565*# Systems Technology, Inc., Hawthorne, Calif.
SPACE SHUTTLE FLYING QUALITIES CRITERIA ASSESSMENT, PHASE 3 Final Report
T. T. Myers, D. E. Johnston, and D. T. McRuer Feb. 1984 129 p refs
(Contract NAS4-3005)
(NASA-CR-170407; NAS 1.26:170407; TR-1197-1) Avail: NTIS HC A07/MF A01 CSCL 01C

The crucial flight data measurement and reduction techniques required for the experimental approach are explored. An overview of available flight data is presented, identification of the effective

augmented vehicle and pilot models determined, a summary of flight data problems compiled, and further recommendations for the Orbiter Flying Qualities (OFQ) experiment provided. Author

N84-20566*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SPACE SHUTTLE PILOT-INDUCED-OSCILLATION RESEARCH TESTING
Bruce G. Powers Feb. 1984 10 p refs Submitted for publication Prepared in cooperation with NASA, Ames Research Center
(NASA-TM-86034; H-1227; NAS 1.15:86034) Avail: NTIS HC A02/MF A01 CSCL 01C

The simulation requirements for investigation of pilot-induced-oscillation (PIO) characteristics during the landing phase are discussed. Orbiters simulations and F-8 digital fly-by-wire aircraft tests are addressed. Author

N84-20567*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
NASA AIRCRAFT CONTROLS RESEARCH, 1983
Gary P. Beasley, comp. Mar. 1984 592 p refs Workshop held in Hampton, Va., 25-27 Oct. 1983
(NASA-CP-2296; L-15730; NAS 1.55:2296) Avail: NTIS HC A25/MF A01 CSCL 01C

The workshop consisted of 24 technical presentations on various aspects of aircraft controls, ranging from the theoretical development of control laws to the evaluation of new controls technology in flight test vehicles. A special report on the status of foreign aircraft technology and a panel session with seven representatives from organizations which use aircraft controls technology were also included. The controls research needs and opportunities for the future as well as the role envisioned for NASA in that research were addressed. Input from the panel and response to the workshop presentations will be used by NASA in developing future programs. For individual titles, see N84-20568 through N84-20600.

N84-20568*# National Aeronautics and Space Administration, Washington, D. C.
NASA CONTROL RESEARCH OVERVIEW
Duncan E. McIver *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 1-22 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

An overview of NASA research activities related to the control of aeronautical vehicles is presented. A groundwork is laid by showing the organization at NASA Headquarters for supporting programs and providing funding. Then a synopsis of many of the ongoing activities is presented, some of which will be presented in greater detail elsewhere. A major goal of the workshop is to provide a showcase of ongoing NASA sponsored research. Then, through the panel sessions and conversations with workshop participants, it is hoped to glean a focus for future directions in aircraft controls research. Author

N84-20569*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
FLYING QUALITIES CRITERIA FOR SUPERAUGMENTED AIRCRAFT
Donald T. Berry *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 25-36 refs Prepared in cooperation with NASA. Ames Research Center (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

An overview of Dryden superaugmented aircraft flying qualities research is presented. This includes F-8 digital fly by wire flight experiments, orbiter flying qualities, shuttle improvements, AFTI/F-16, flying qualities and control system alternatives, Vertical Motion Simulator Shuttle evaluation and Total in Flight Simulator pitch rate criteria. Author

N84-20570*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
LARGE AIRCRAFT HANDLING QUALITIES
William D. Grantham *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 37-50 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The short period frequency requirements of MIL-F-8785C are applicable to the very large transport aircraft simulated. The large aircraft simulated meet the requirements of NASA CR-159236 for effective time delay and pitch transient peak ratio. However, the requirements of this reference for the effective rise time parameter are believed to be too conservative for very large transport aircraft. Data obtained to date as well as other data indicate that MIL-SPEC requirements for the parameter t(phi=30 degrees) are too conservative for very large transport aircraft. The results of the present study indicate that t(phi=30 degrees) of less than 6 sec should result in "acceptable" roll response characteristics, and t(phi=30 degrees) of less than 4.0 sec should result in "satisfactory" roll response. Author

N84-20571*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A SUMMARY OF ROTORCRAFT HANDLING QUALITIES RESEARCH AT NASA AMES RESEARCH CENTER
Robert T. N. Chen *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 51-68 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The objectives of the rotorcraft handling qualities research program at Ames Research Center are twofold: (1) to develop basic handling qualities design criteria to permit cost effective design decisions to be made for helicopters, and (2) to obtain basic handling qualities data for certification of new rotorcraft configurations. The research on the helicopter handling qualities criteria has focused primarily on military nap-of-the-earth (NOE) terrain flying missions, which are flown in day visual meteorological conditions (VMC) and instrument meteorological conditions (IMC), or at night. The Army has recently placed a great deal of emphasis on terrain flying tactics in order to survive and effectively complete the missions in modern and future combat environments. Unfortunately, the existing Military Specification MIL-H 8501A which is a 1961 update of a 1951 document, does not address the handling qualities requirements for terrain flying. The research effort is therefore aimed at filling the void and is being conducted jointly with the Army Aeromechanics Laboratory at Ames. The research on rotorcraft airworthiness standards with respect to flying qualities requirements was conducted to collaboration with the Federal Aviation Administration (FAA). Author

N84-20572*# Systems Technology, Inc., Hawthorne, Calif.
FLEXIBLE AIRCRAFT FLYING AND RIDE QUALITIES
Irving L. Ashkenas, Raymond E. Magdaleno, and Duane T. McRuer *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 69-92 ref (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

A brief analytic exposition is presented to illustrate a central principle in flexible mode control, some of the pertinent pilot centered requirements are listed and discussed. The desired features of the control methodology are exposed and the methodology to be used is selected. The example Boeing supplied characteristics are discussed and approximated with a reduced order model and a simplified treatment of unsteady aerodynamics. The closed loop flight control system design follows, along with first level assessments of resulting handling and ride quality characteristics. Some of these do not meet the postulated requirements and remain problems to be solved possibly by further analysis or future simulation. Author

N84-20573*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPLICATIONS OF CONTROL TECHNOLOGY ON AIRCRAFT DESIGN
Steven M. Sliwak and P. Douglas Arbuckle *In its* NASA Aircraft

Controls Research, 1983 Mar. 1984 p 93-114 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

New controls technologies are now available for implementation with aircraft systems. Many aircraft with state of the art technology in the fields of aerodynamics, structures, and propulsion require extensive augmentation merely for safety of flight considerations in addition to potential performance improvements. The actual performance benefits of integrating the new controls concepts with other new technologies is optimized by including such considerations early in the design process. Recently, several advanced aircraft designs have run into considerable problems related to control systems and flying qualities during flight test, requiring costly redesign and fine tuning efforts. It is no longer possible for the aircraft design to be completed prior to getting the control specialists involved. The challenge to the control system designer has become so great that his concerns must be considered at the conceptual design level. A computer program developed at NASA for evaluating the economic payoffs of integrating controls into the design of transport aircraft at the beginning will be described. Author

N84-20574*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RELIABILITY AND MAINTAINABILITY ASSESSMENT FACTORS FOR RELIABLE FAULT-TOLERANT SYSTEMS c38
Salvatore J. Bavuso *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 115-134 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 14D

A long term goal of the NASA Langley Research Center is the development of a reliability assessment methodology of sufficient power to enable the credible comparison of the stochastic attributes of one ultrareliable system design against others. This methodology, developed over a 10 year period, is a combined analytic and simulative technique. An analytic component is the Computer Aided Reliability Estimation capability, third generation, or simply CARE III. A simulative component is the Gate Logic Software Simulator capability, or GLOSS. The numerous factors that potentially have a degrading effect on system reliability and the ways in which these factors that are peculiar to highly reliable fault tolerant systems are accounted for in credible reliability assessments. Also presented are the modeling difficulties that result from their inclusion and the ways in which CARE III and GLOSS mitigate the intractability of the heretofore unworkable mathematics. Author

N84-20575*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
PRACTICAL ASPECTS OF MODELING AIRCRAFT DYNAMICS FROM FLIGHT DATA c05
Kenneth W. Iliff and Richard E. Maine *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 135-154 Prepared in cooperation with NASA. Ames Research Center (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The purpose of parameter estimation, a subset of system identification, is to estimate the coefficients (such as stability and control derivatives) of the aircraft differential equations of motion from sampled measured dynamic responses. In the past, the primary reason for estimating stability and control derivatives from flight tests was to make comparisons with wind tunnel estimates. As aircraft became more complex, and as flight envelopes were expanded to include flight regimes that were not well understood, new requirements for the derivative estimates evolved. For many years, the flight determined derivatives were used in simulations to aid in flight planning and in pilot training. The simulations were particularly important in research flight test programs in which an envelope expansion into new flight regimes was required. Parameter estimation techniques for estimating stability and control derivatives from flight data became more sophisticated to support the flight test programs. As knowledge of these new flight regimes increased, more complex aircraft were flown. Much of this increased complexity was in sophisticated flight control systems. The design and refinement of the control system required higher fidelity simulations than were previously required. Author

N84-20576*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATIONS OF MODEL STRUCTURE DETERMINATION TO FLIGHT TEST DATA c05
James G. Batterson and Vladislav Klein (George Washington Univ., Hampton, Va.) *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 155-170 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Several statistical and information criteria need to be considered when selecting an adequate model. Incorrect stability and control derivates result from inadequate aerodynamic model structure. Stepwise regression is used to determine the structure for an adequate model. Flight data which covers a nonlinear aerodynamic model range may be analyzed as a single data set or partitioned into several distinct sets. Stepwise regression for model structure determination and parameter estimation was successfully applied to three aircraft types (single engine general aviation, unaugmented modern jet fighter, jet transport). B.G.

N84-20577*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MIXING 4D-EQUIPPED AND UNEQUIPPED AIRCRAFT IN THE TERMINAL AREA c04
L. Tobias, H. Erzberger, H. Q. Lee, and P. J. OBrien (FAA, Atlantic City, N.J.) *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 171-190 ref (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

On-board 4D guidance systems, which predict and control the touchdown time of an aircraft to an accuracy of a few seconds throughout the descent, were developed and demonstrated in several flight test programs. However, in addition to refinements of the on board system, two important issues still need to be considered. First, in order to make effective use of these on-board systems, it is necessary to understand and develop the interactions of the airborne and air traffic control (ATC) system in the proposed advanced environment. Unless the total system is understood, the advanced on-board system may prove unusable from an ATC standpoint. Second, in planning for a future system in which all aircraft are 4D equipped, it is necessary to confront the transition situation in which some percentage of traffic must still be handled by conventional means. In terms of 4D, this means that some traffic must still be given radar vectors and speed clearances (that is, be spaced by conventional distance separation techniques), while the 4D-equipped aircraft need to be issued time assignments. These apparent differences are reconciled and efficient ATC operation is developed. Author

N84-20578*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPLICATION OF FUEL/TIME MINIMIZATION TECHNIQUES TO ROUTE PLANNING AND TRAJECTORY OPTIMIZATION c04
Charles E. Knox *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 191-208 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

Rising fuel costs combined with other economic pressures have resulted in industry requirements for more efficient air traffic control and airborne operations. NASA has responded with an on-going research program to investigate the requirements and benefits of using new airborne guidance and pilot procedures that are compatible with advanced air traffic control systems and that will result in more fuel efficient flight. The results of flight testing an airborne computer algorithm designed to provide either open-loop or closed-loop guidance for fuel efficient descents while satisfying time constraints imposed by the air traffic control system is summarized. Some of the potential cost and fuel savings that are

obtained with sophisticated vertical path optimization capabilities are described. Author

N84-20579*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FEEDBACK LAWS FOR FUEL MINIMIZATION FOR TRANSPORT AIRCRAFT **c05**
Douglas B. Price and Christopher Gracey *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 209-219 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The Theoretical Mechanics Branch has as one of its long-range goals to work toward solving real-time trajectory optimization problems on board an aircraft. This is a generic problem that has application to all aspects of aviation from general aviation through commercial to military. Overall interest is in the generic problem, but specific problems to achieve concrete results are examined. The problem is to develop control laws that generate approximately optimal trajectories with respect to some criteria such as minimum time, minimum fuel, or some combination of the two. These laws must be simple enough to be implemented on a computer that is flown on board an aircraft, which implies a major simplification from the two point boundary value problem generated by a standard trajectory optimization problem. In addition, the control laws allow for changes in end conditions during the flight, and changes in weather along a planned flight path. Therefore, a feedback control law that generates commands based on the current state rather than a precomputed open-loop control law is desired. This requirement, along with the need for order reduction, argues for the application of singular perturbation techniques. Author

N84-20580*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDENTIFICATION OF MULTIVARIABLE HIGH-PERFORMANCE TURBOFAN ENGINE DYNAMICS FROM CLOSED LOOP DATA **c07**
Walter C. Merrill *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 221-238 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

A typical engine control design cycle consists of developing a dynamic engine simulation from steady-state component performance data, designing a control based upon this simulation, and then testing and modifying the control in an engine test cell to meet performance requirements. This design cycle was successful for state-of-the-art engines. However, for more advanced multivariable engines that exhibit strong variable interactions, this procedure will result in substantial trial and error modification of the control during the testing phase. One method to automate the design process and reduce control modification testing and development cost would be to identify accurate dynamic models directly from the closed-loop test data. These identified models would then be used in conjunction with a synthesis procedure to systematically refine the control. Recent advances in closed-loop identifiability present a methodology for this direct identification of engine model dynamics from closed-loop test data. The application of an identification method to simulated and actual closed-loop F100 engine data is described. This study was undertaken to determine if useful dynamic engine models could be identified directly from closed-loop engine test data. Author

N84-20581*# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.
EIGENSPACE DESIGN TECHNIQUES FOR ACTIVE FLUTTER SUPPRESSION
William L. Garrard and Bradley S. Liebst *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 241-261 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The application of eigenspace design techniques to an active flutter suppression system for the DAST ARW-2 research drone is examined. Eigenspace design techniques allow the control system designer to determine feedback gains which place controllable eigenvalues in specified configurations and which shape eigenvectors to achieve desired dynamic response. Eigenspace techniques were applied to the control of lateral and longitudinal dynamic response of aircraft. However, little was published on the application of eigenspace techniques to aeroelastic control problems. This discussion will focus primarily on methodology for design of full-state and limited-state (output) feedback controllers. Most of the states in aeroelastic control problems are not directly measurable, and some type of dynamic compensator is necessary to convert sensor outputs to control inputs. Compensator design are accomplished by use of a Kalman filter modified if necessary by the Doyle-Stein procedure for full-state loop transfer function recovery, by some other type of observer, or by transfer function matching. Author

N84-20582*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TOOLS FOR ACTIVE CONTROL SYSTEM DESIGN
William M. Adams, Jr., Sherwood H. Tiffany, and Jerry R. Newsom *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 263-279 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Efficient control law analysis and design tools which properly account for the interaction of flexible structures, unsteady aerodynamics and active controls are developed. Development, application, validation and documentation of efficient multidisciplinary computer programs for analysis and design of active control laws are also discussed. B.G.

N84-20583*# Information and Control Systems, Inc., Hampton, Va.
ALGORITHMS FOR OUTPUT FEEDBACK, MULTIPLE-MODEL, AND DECENTRALIZED CONTROL PROBLEMS
Nesim Halyo and John R. Broussard *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 281-304 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The optimal stochastic output feedback, multiple-model, and decentralized control problems with dynamic compensation are formulated and discussed. Algorithms for each problem are presented, and their relationship to a basic output feedback algorithm is discussed. An aircraft control design problem is posed as a combined decentralized, multiple-model, output feedback problem. A control design is obtained using the combined algorithm. An analysis of the design is presented. Author

N84-20584*# Purdue Univ., Lafayette, Ind. School of Aeronautics and Astronautics.
PILOT MODELING, MODAL ANALYSIS, AND CONTROL OF LARGE FLEXIBLE AIRCRAFT
David K. Schmidt *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 305-327 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The issues to be addressed are threefold. The first deals with the question of whether dynamic aeroelastic effects can significantly impact piloted flight dynamics. For example, if one were to explore this problem experimentally, what mathematical model would be appropriate to use in the simulation? What modes, for example, should be included in the simulation, or what linear model should be used in the control synthesis? The second question deals with the appropriate design criteria or design objectives. In the case of active control, for example, what would be the design objectives for the control synthesis if aeroelastic effects are a problem? The outline of the topics includes a description of a model analysis methodology aimed at answering the question of the significance of higher order dynamics. Secondly, a pilot vehicle analysis of some experimental data addresses the question of "What's important in the task?" The experimental data will be presented briefly, followed by the results of an open-loop modal analysis of the generic vehicle configurations in question. Finally, one of the

vehicles will be augmented via active control and the results presented. Author

N84-20585*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
NONLINEAR SYSTEMS APPROACH TO CONTROL SYSTEM DESIGN
George Meyer *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 329-341 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Consider some of the control system design methods for plants with nonlinear dynamics. If the nonlinearity is weak relative to the size of the operating region, then the linear methods apply directly. Fixed-gain design may be feasible even for significant nonlinearities. It may be possible to find a single gain which provides adequate control of the linear models at several perturbation points. If the nonlinearity is restricted to a sector, that fact may be used to obtain a fixed-gain controller. Otherwise, a gain may have to be associated with each perturbation point Pi. A gain schedule K(p(v)) is obtained by connecting the perturbation points by a function, say p(v), of the scheduling parameter v (i.e., speed). When the scheduling parameter must be multidimensional, this approach is difficult; the objective is to develop an easier procedure. R.J.F.

N84-20586*# Massachusetts Inst. of Tech., Boston.
ADAPTIVE CONTROL: MYTHS AND REALITIES
Michael Athans and Lena Valavani *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 343-361 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

It was found that all currently existing globally stable adaptive algorithms have three basic properties in common: positive realness of the error equation, square-integrability of the parameter adjustment law and, need for sufficient excitation for asymptotic parameter convergence. Of the three, the first property is of primary importance since it satisfies a sufficient condition for stability of the overall system, which is a baseline design objective. The second property has been instrumental in the proof of asymptotic error convergence to zero, while the third addresses the issue of parameter convergence. Positive-real error dynamics can be generated only if the relative degree (excess of poles over zeroes) of the process to be controlled is known exactly; this, in turn, implies perfect modeling. This and other assumptions, such as absence of nonminimum phase plant zeros on which the mathematical arguments are based, do not necessarily reflect properties of real systems. As a result, it is natural to inquire what happens to the designs under less than ideal assumptions. The issues arising from violation of the exact modeling assumption which is extremely restrictive in practice and impacts the most important system property, stability, are discussed. R.J.F.

N84-20587*# Textron, Inc., Irvine, Calif.
FOREIGN TECHNOLOGY SUMMARY OF FLIGHT CRUCIAL FLIGHT CONTROL SYSTEMS
H. A. Rediess *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 365-386 refs (For primary document see N84-20567 11-08)
(Contract NAS1-17403)
Avail: NTIS HC A25/MF A01 CSCL 01C

A survey of foreign technology in flight crucial flight controls is being conducted to provide a data base for planning future research and technology programs. Only Free World countries were surveyed, and the primary emphasis was on Western Europe because that is where the most advanced technology resides. The survey includes major contemporary systems on operational aircraft, R&D flight programs, advanced aircraft developments, and major research and technology programs. The information was collected from open literature, personal communications, and a tour of several companies, government organizations, and research laboratories in the United Kingdom, France, and the Federal Republic of Germany. A summary of the survey results to date is presented. R.J.F.

N84-20588*# Boeing Commercial Airplane Co., Seattle, Wash.
FUNCTIONAL INTEGRATION OF VERTICAL FLIGHT PATH AND SPEED CONTROL USING ENERGY PRINCIPLES
A. A. Lambregts *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 389-409 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

A generalized automatic flight control system was developed which integrates all longitudinal flight path and speed control functions previously provided by a pitch autopilot and autothrottle. In this design, a net thrust command is computed based on total energy demand arising from both flight path and speed targets. The elevator command is computed based on the energy distribution error between flight path and speed. The engine control is configured to produce the commanded net thrust. The design incorporates control strategies and hierarchy to deal systematically and effectively with all aircraft operational requirements, control nonlinearities, and performance limits. Consistent decoupled maneuver control is achieved for all modes and flight conditions without outer loop gain schedules, control law submodes, or control function duplication. R.J.F.

N84-20589*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLIGHT TEST RESULTS FOR THE DIGITAL INTEGRATED AUTOMATIC LANDING SYSTEMS (DIALS): A MODERN CONTROL FULL-STATE FEEDBACK DESIGN **c04**
R. M. Hueschen *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 411-428 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 17G

The Digital Integrated Automatic Landing System (DIALS) is discussed. The DIALS is a modern control theory design performing all the maneuver modes associated with current autoland systems: localizer capture and track, glideslope capture and track, decrab, and flare. The DIALS is an integrated full-state feedback system which was designed using direct-digital methods. The DIALS uses standard aircraft sensors and the digital Microwave Landing System (MLS) signals as measurements. It consists of separately designed longitudinal and lateral channels although some cross-coupling variables are fed between channels for improved state estimates and trajectory commands. The DIALS was implemented within the 16-bit fixed-point flight computers of the ATOPS research aircraft, a small twin jet commercial transport outfitted with a second research cockpit and a fly-by-wire system. The DIALS became the first modern control theory design to be successfully flight tested on a commercial-type aircraft. Flight tests were conducted in late 1981 using a wide coverage MLS on Runway 22 at Wallops Flight Center. All the modes were exercised including the capture and track of steep glidescopes up to 5 degrees. R.J.F.

N84-20590*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF ADVANCED CONTROL TECHNIQUES TO AIRCRAFT PROPULSION SYSTEMS **c07**
Bruce Lehtinen *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 429-442 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

Two programs are described which involve the application of advanced control techniques to the design of engine control algorithms. Multivariable control theory is used in the F100 MVCS (multivariable control synthesis) program to design controls which coordinate the control inputs for improved engine performance. A systematic method for handling a complex control design task is given. Methods of analytical redundancy are aimed at increasing the control system reliability. The F100 DIA (detection, isolation, and accommodation) program, which investigates the uses of software to replace or augment hardware redundancy for certain critical engine sensor, is described. R.J.F.

N84-20591*# Lockheed-California Co., Burbank.
L-1011 TESTING WITH RELAXED STATIC STABILITY

J. J. Rising and K. R. Henke *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 443-467 ref (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Wind tunnel and flight tests indicate that fuel savings of 2 percent can be achieved by center of gravity (C.G.) management for an L-1011 with the current wing configuration. The normal c.b. location is at 25 percent mean aerodynamic center (MAC). The maximum fuel saving occurs for a C.G. location of 35 percent MAC. However, flight at 35 percent requires that the C.G. range be extended aft of the 35-percent point. Flight at C.G. locations aft or 35 percent requires a pitch active control system (PACS) so that handling qualities are not significantly degraded. The development of this PACS is discussed. R.J.F.

N84-20592*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
AFTI/F-16 DIGITAL FLIGHT CONTROL SYSTEM EXPERIENCE
Dale A. Mackall *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 469-487 refs Prepared in cooperation with NASA. Ames Research Center (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The Advanced Flighter Technology Integration (AFTI) F-16 program is investigating the integration of emerging technologies into an advanced fighter aircraft. The three major technologies involved are the triplex digital flight control system; decoupled aircraft flight control; and integration of avionics, pilot displays, and flight control. In addition to investigating improvements in fighter performance, the AFTI/F-16 program provides a look at generic problems facing highly integrated, flight-crucial digital controls. An overview of the AFTI/F-16 systems is followed by a summary of flight test experience and recommendations. R.J.F.

N84-20593*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EXPERIENCES WITH THE DESIGN AND IMPLEMENTATION OF FLUTTER SUPPRESSION SYSTEMS
Jerry R. Newsom and Irving Abel *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 489-508 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Research efforts aim at flutter suppression are discussed. The application of active controls technology to reduce the aeroelastic response of aircraft structures is discussed. Feedback control, control law design processes and synthesis, wind tunnel studies, and delta-wing wind tunnel models are discussed. R.J.F.

N84-20594*# Douglas Aircraft Co., Inc., Long Beach, Calif.
RESEARCH OPPORTUNITIES FOR FUTURE COMMERCIAL TRANSPORTS **c05**
J. F. Longshore *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 511-517 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Research applicable to commercial aircraft is briefly discussed. Display devices, fly by wire control systems, and systems compatibility are among the topics discussed. R.J.F.

N84-20595*# Gates Learjet Corp., Wichita, Kans.
A BRIEF REVIEW OF AIRCRAFT CONTROLS RESEARCH OPPORTUNITIES IN THE GENERAL AVIATION FIELD
Eric R. Kendall *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 519-536 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

A review of aircraft controls research in the general aviation field is given. Among the topics included are: controls technology benefits, military and commercial test programs, flight tests, ride quality control, and wind loading. R.J.F.

N84-20596*# Boeing Vertol Co., Philadelphia, Pa.
RESEARCH OPPORTUNITIES FOR ROTORCRAFT **c05**
Bruce B. Blake *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 537-548 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The control of structural vibration is helicopters is discussed. Active control concepts, wind tunnel tests, rotor vibratory loads, systems integration, and engine control are among the topics discussed. R.J.F.

N84-20597*# Northrop Corp., Hawthorne, Calif. Aircraft Div.
FIGHTER AIRCRAFT FLIGHT CONTROL TECHNOLOGY DESIGN REQUIREMENTS
W. E. Nelson, Jr. *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 549-557 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

The evolution of fighter aircraft flight control technology is briefly surveyed. Systems engineering, battle damage considerations for adaptive flutter suppression, in-flight simulation, and artificial intelligence are briefly discussed. R.J.F.

N84-20598*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
MILITARY AIRCRAFT RESEARCH OPPORTUNITIES FOR THE FUTURE **c05**
Robert C. Schwanz *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 559-569 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Military aircraft research opportunities for the future are briefly surveyed. Aircraft control theory, design analysis, systems integration and flight characteristics are discussed. R.J.F.

N84-20599*# Honeywell Systems and Research Center, Minneapolis, Minn.
OPPORTUNITIES FOR AIRCRAFT CONTROLS RESEARCH
Thomas B. Cunningham *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 571-584 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 01C

Several problems which drive aircraft control technology are discussed. Highly unstable vehicles, flutter speed boundary expansion, and low level automated flight that follows terrain are discussed. R.J.F.

N84-20600*# Pratt and Whitney Aircraft Group, East Hartford, Conn.
PROPULSION CONTROL TECHNOLOGY **c07**
Edward C. Beattie *In* NASA. Langley Research Center NASA Aircraft Controls Research, 1983 Mar. 1984 p 585-592 (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 21E

A brief discussion of digital jet engine control systems is given. Performance tests, systems integration, and redundancy are discussed. R.J.F.

N84-20601# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
DESIGN OF LONGITUDINAL CONTROL LAWS FOR THE X-29A BACKUP ANALOG FLIGHT CONTROL SYSTEM M.S. Thesis
H. L. Emrick Sep. 1983 146 p
(AD-A137814; AFIT/GAE/AA/83S-3) Avail: NTIS HC A07/MF A01 CSCL 01/3

X-29 wind tunnel data were input to the computer program TTYLON to produce alpha/delta c, Nz/delta c, and q/delta c bare airframe transfer functions throughout the flight envelope. The short period mode below Mach 1 was unstable. Where it was stable, the response was slow. The normal acceleration sensor was placed so that the short period frequency would be within the desired range of 3 to 10 rad/sec. Nz feedback was used to stabilize the short period mode. Pitch rate feedback was also used to add damping for Level 1 flying qualities in the short period mode. To stabilize the phugoid mode and achieve Level 1 flying

qualities, a lag filter design was developed. Gain schedules for KNz and Kq, which were found using classical multiloop control law design are presented. Author (GRA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N84-20602*# National Aeronautics and Space Administration, Washington, D. C.
TWO-DIMENSIONAL WIND TUNNEL
Aug. 1982 23 p refs Transl. into ENGLISH from Natl. Aerospace Lab. News (Tokyo), no. 246, Nov. 1979 p 1-8 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76963; NAS 1.15:76963) Avail: NTIS HC A02/MF A01 CSCL 14B

Information on the Japanese National Aerospace Laboratory two dimensional transonic wind tunnel, completed at the end of 1979 is presented. Its construction is discussed in detail, and the wind tunnel structure, operation, test results, and future plans are presented. Author

N84-20603# Oregon State Univ., Corvallis. Dept. of Mechanical Engineering.
LABORATORY EVALUATION OF NOVEL PARTICULATE CONTROL CONCEPTS FOR JET ENGINE TEST CELLS Final Report, 7 Jan. 1981 - 30 Sep. 1982
Richard W. Boubel Tyndall AFB, Fla. Air Force Engineering and Services Center Dec. 1983 222 p
(Contract F08635-81-K-0003; AF Proj. 1900)
(AD-A137641; AFESC/ESL-TR-83-02) Avail: NTIS HC A10/MF A01 CSCL 21/2

Three control devices were evaluated in the laboratory to determine their ability to reduce visible emissions from jet engine test cells. The three control devices - a low-pressure drop wet scrubber, a wetted-sand filter, and a high-temperature, ceramic fabric baghouse - were tested on the exhaust of a small gas turbine engine with a variable resistive load. Three fuel mixtures were used in experimental runs: 100 percent kerosene, 100 percent toluene, and a 50/50 blend of kerosene and toluene. Smoke number measurements of the treated and untreated exhaust stream were compared to evaluate the reduction in visual emissions for each control device. None of the three devices tested indicated enough reduction in plume opacity to justify construction of full-scale test cell control systems. Recommendations were made for future evaluation of modified wetted sand filter and ceramic fiber baghouse control devices. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration.*

N84-20604*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A LARGE-AREA GAMMA-RAY IMAGING TELESCOPE SYSTEM Final Report, 24 Mar. - 1 Sep. 1983
David G. Koch Aug. 1983 100 p refs
(Contract NAS2-3743)
(NASA-CR-175435; NAS 1.26:175435) Avail: NTIS HC A05/MF A01 CSCL 22A

The concept definition of using the External Tank (ET) of the Space Shuttle as the basis for constructing a large area gamma ray imaging telescope in space is detailed. The telescope will be used to locate and study cosmic sources of gamma rays of energy greater than 100 MeV. Both the telescope properties and the means whereby an ET is used for this purpose are described. A parallel is drawn between those systems that would be common to both a Space Station and this ET application. In addition, those systems necessary for support of the telescope can form the basis for using the ET as part of the Space Station. The major conclusions of this concept definition are that the ET is ideal for making into a gamma ray telescope, and that this telescope will provide a substantial increase in collecting area. S.L.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

No abstracts in this category.

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air).*

N84-20605*# Engineering and Economics Research, Inc., Vienna, Va.
AN ATTACHED PAYLOAD OPERATIONS CENTER (APOC) AT THE GODDARD SPACE FLIGHT CENTER (GSFC), VOLUME 1 Final Report
7 Dec. 1983 101 p 2 Vol.
(Contract NAS5-26962)
(NASA-CR-175160; NAS 1.26:175160) Avail: NTIS HC A06/MF A01 CSCL 14B

A management overview of the Attached Payload Operations Center (APOC) functional requirements and design are presented. The rationale for developing the APOC concept and the assumptions utilized are presented. A summary of the concept complete with major functional areas and associated data flows is provided. The attributes of this concept are formalized and the necessary resources needed for its development and operation presented. S.L.

N84-20606# Information Spectrum, Inc., Arlington, Va.
MULTIPLE LAUNCH ROCKET SYSTEM: A CASE STUDY OF MANPOWER, PERSONNEL AND TRAINING REQUIREMENTS DETERMINATION Research Note
F. E. OConnor, R. L. Fairall, and E. H. Birdseye Jan. 1984 167 p
(Contract MDA903-81-C-0386; DA Proj. 2Q1-62722-A-791)
(AD-A137644; ARI-RN-84-30) Avail: NTIS HC A08/MF A01 CSCL 05/9

This report describes and analyzes the procedures used to determine Manpower, Personnel, and Training (MPT) requirements for the Multiple Launch Rocket System (MLRS) and related accomplishment of actual MPT events/documents to those called for in the Life Cycle System Management Model (LCSMM). It addresses concerns being raised about the adequacy and timeliness of the Army's MPT requirements determination procedures. Author (GRA)

N84-20607# Naval Research Lab., Washington, D. C.
THERMAL VACUUM TEST FACILITY Final Report
K. M. Miller 31 Jan. 1984 113 p
(AD-A137712; NRL-MR-5217) Avail: NTIS HC A06/MF A01

CSCL 14/2

An important part of development of electronic packages for space use is verification of performance under expected environmental conditions. The system developed at NRL is designed to provide thermal vacuum testing of atomic clocks in the Global Positioning System (GPS). It is capable of testing all pertinent clock parameters in a preprogrammed sequence. Test durations from minutes to months may be selected. Real time as well as historical data presentation and reductions are available. Author (GRA)

N84-20608# Test Group (6585th), Holloman AFB, N. Mexico Test Track Div.
TRANSMITTED THRUST ON A LARGE DUAL RAIL ROCKET SLED SYSTEM Final Technical Report, Feb. 1981 - Nov. 1983
Larry C. Mixon Eglin AFB, Fla. Armament Div. (AFSC) Nov. 1983 237 p
(AF Proj. TKSI)
(AD-A137151; AD-TR-83-86) Avail: NTIS HC A11/MF A01 CSCL 14/2

A measurements program was conducted as part of the Tether Qualification Program. A large dual-rail sled system consisted of a pusher sled with two Sergeant rocket motors and two Improved Honest John (IHJ) rocket motors and a guidance system forebody. In the tether configuration, the two Sergeant motors are ignited at launch minus 10 seconds and excess fuel is burned off. The two IHJ motors are ignited later in the test profile to provide a step in acceleration profile which assists in identification and separation of guidance system errors. The prime instrumentation consisted of an instrumented bolt (force transducer) that connected the pusher sled to the forebody sled. Other instrumentation was added to the guidance forebody for correlation studies. Extremely good quality and consistent data was obtained on all instrumentation systems. Correlation studies were conducted whereby the theoretical quasi-steady state (Q.S.S.) transmitted thrust was compared to measured data and it was established that 35% of the total system drag was attributed to the pusher in the wake of the forebody. Several different approaches were made to correlate the oscillatory transmitted thrust to system parameters. The most acceptable times the predictable Q.S.S. transmitted thrust. GRA

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N84-20609 Texas Univ., Austin.
NON-GRAVITATIONAL FORCE MODELLING AND ALTIMETER MEASUREMENT MODELLING FOR SEASAT-A SATELLITE Ph.D. Thesis
P. A. M. Abusali 1983 236 p
Avail: Univ. Microfilms Order No. DA8329804

The SEASAT altimeter measurements have an accuracy of about 10 cm. In order to make best use of the altimeter measurements for oceanographic and other applications, the radial component of the satellite orbit must be known with an accuracy of about 10 cm. In the orbit computation, drag and solar radiation pressure are significant perturbations. Uncertainties in the reference which appear in these models along with errors in the atmospheric density model are primary error sources, limiting the orbit determination accuracy. In the case of SEATSAT, the effective areas vary considerably with time. In this research, models which account for the actual area variations are developed. To account for the atmospheric density model errors, a set of empirical density model parameters is defined and estimated in the data analysis process. These models are used to achieve laser range residual of 0.939 meter root mean square for a 16 day SEASAT orbit, a factor of about four improvement, over that obtained using the constant area models. Dissert. Abstr.

N84-20610*# Michigan State Univ., East Lansing. Dept. of Botany and Plant Pathology.
THE ALPHA-HELIX CONCEPT: INNOVATIVE UTILIZATION OF THE SPACE STATION PROGRAM. A REPORT TO THE NATIONAL AERONAUTICAL AND SPACE ADMINISTRATION REQUESTING ESTABLISHMENT OF A SENSORY PHYSIOLOGY LABORATORY ON THE SPACE STATION Final Report
Robert S. Bandurski and Neelam Singh 17 Oct. 1983 71 p refs
(Contract NASw-3748)
(NASA-CR-175436; NAS 1.26:175436) Avail: NTIS HC A04/MF A01 CSCL 22B

A major laboratory dedicated to biological-medical research is proposed for the Space Platform. The laboratory would focus on sensor physiology and biochemistry since sensory physiology represents the first impact of the new space environment on living organisms. Microgravity and the high radiation environment of space would be used to help solve the problems of prolonged sojourns in space but, more importantly, to help solve terrestrial problems of human health and agricultural productivity. The emphasis would be on experimental use of microorganisms and small plants and small animals to minimize the space and time required to use the Space Platform for maximum human betterment. The Alpha Helix Concept, that is, the use of the Space Platform to bring experimental biomedicine to a new and extreme frontier is introduced so as to better understand the worldly environment. Staffing and instrumenting the Space Platform biomedical laboratory in a manner patterned after successful terrestrial sensory physiology laboratories is also proposed. Author

N84-20611*# Future Systems, Inc., Gaithersburg, Md.
ADVANCED TECHNOLOGY SATELLITES IN THE COMMERCIAL ENVIRONMENT. VOLUME 1: EXECUTIVE SUMMARY
Mar. 1984 25 p refs 2 Vol.
(Contract NAS3-23783)
(NASA-CR-174635-Vol-1; NAS 1.26:174635-Vol-1) Avail: NTIS HC A02/MF A01 CSCL 22B

A set of scenarios, based on a set of traffic demand forecasts is postulated. The scenarios use a demand-driven model to launch satellites, with other limits on the available (and economical) technology. The results using a low traffic forecast show a continuing oversupply of transponders. However, the scenarios using a high traffic forecast show that considerable advanced technology including the use of 30/20 GHz is needed to satisfy demand. S.L.

N84-20612*# Future Systems, Inc., Gaithersburg, Md.
ADVANCE TECHNOLOGY SATELLITES IN THE COMMERCIAL ENVIRONMENT, VOLUME 2 Final Report
Mar. 1984 294 p refs 2 Vol.
(Contract NAS3-23783)
(NASA-CR-174635-Vol-2; NAS 1.26:174635-Vol-2) Avail: NTIS HC A13/MF A01 CSCL 22B

A forecast of transponder requirements was obtained. Certain assumptions about system configurations are implicit in this process. The factors included are interpolation of baseline year values to produce yearly figures, estimation of satellite capture, effects of peak-hours and the time-zone staggering of peak hours, circuit requirements for acceptable grade of service capacity of satellite transponders, including various compression methods where applicable, and requirements for spare transponders in orbit. The graphical distribution of traffic requirements was estimated. S.L.

N84-20613# Committee on Commerce, Science, and Transportation (U. S. Senate).
CIVIL SPACE STATION
Washington GPO 1984 91 p refs Hearing before the Subcomm. on Sci., Technol. and Space of the Comm. on Com., Sci. and Transportation, 98th Congr., 1st Sess., 15 Nov. 1983
(S-Rept-98-523; GPO-29-426) Avail: Subcommittee on Science, Technology and Space

How present uses of space can be extended and how other capabilities can be developed that have a unique applicability to a

permanent presence in space are issues explored. Existing alternatives for accomplishing the nation's objectives in space are examined and the advantages and disadvantages of each are considered. Private sector involvement, the possibility of international cooperation, and the functions and concepts for a mixture of manned and unmanned elements are discussed. A.R.H.

N84-20614# Committee on Science and Technology (U. S. House).
THE COMMERCIALIZATION OF METEOROLOGICAL AND LAND REMOTE-SENSING SATELLITES
Washington GPO 1984 1582 p Hearings before the Subcomm. on Nat. Resources, Agr. Res. and Environ. and the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., No. 53, 14 Apr., 21, 28 Jun., 14, 21 Jul., 8-9 Nov. 1983
(GPO-20-901) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

The potential impact of the proposal to transfer both civilian weather satellites and the LANDSAT remote sensing satellite system to the private sector is examined. Issues discussed include the importance of METSAT and LANDSAT data; whether remotely sensed data is a public good; data continuity; international data exchange; international relations and LANDSAT; international competition; national security; monopoly and competition; government's role after the transfer; and the need for legislation. A list of the witnesses heard is included. A.R.H.

N84-20615# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A COMBINATORIAL GEOMETRY COMPUTER DESCRIPTION OF THE M48A1 CHAPARRAL MISSILE SYSTEM Final Report
Penelope A. Cline and Frederick S. Brundick Dec. 1983 285 p
(AD-A137262; AD-F300376; ARBRL-MR-03326) Avail: NTIS HC A13/MF A01 CSCL 16/4

This report documents a Combinatorial Geometry (COM-GEOM) target description of the M48A1 Chaparral Missile System. A high level of detail was used to satisfy the requirements for a SPARC analysis. Appendix A contains the actual computer description of the M48A1 Chaparral Missile System. This description is available at the BRL on cards, magnetic tape, and magnetic disc. The shotline output of the GRID subroutine of the GIFT code is also stored on magnetic tape for future vulnerability analysis. GRA

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation.*

N84-20616*# Analytical Mechanics Associates, Inc., Hampton, Va.
STS-9 BET PRODUCTS
John T. Findlay, G. Mel Kelly, Michael L. Heck, Judy G. McConnell, and Martin W. Henry Feb. 1984 169 p refs
(Contract NAS1-16087)
(NASA-CR-172314; NAS 1.26:172314; AMA-84-3) Avail: NTIS HC A08/MF A01 CSCL 05B

The final products generated for the STS-9, which landed on December 8, 1983 are reported. The trajectory reconstruction utilized an anchor epoch of GMT corresponding to an initial altitude of h 356 kft, selected in view of the limited tracking coverage available. The final state utilized IMU2 measurements and was based on processing radar tracking from six C-bands and a single S-band station, plus six photo-theodolite cameras in the vicinity of Runway 17 at Edwards Air Force Base. The final atmosphere (FLAIR9/UN=581199C) was based on a composite of the remote measured data and the 1978 Air Force Reference Atmosphere model. The Extended BET is available as STS9BET/UN=274885C. The AEROBET and MMLE input files created are discussed. Plots of the more relevant parameters from the AEROBET (reel number NL0624) are included. Input parameters, final residual plots, a trajectory listing, and data archival information are defined. E.A.K.

N84-20617*# Lockheed Aircraft Corp., Burbank, Calif.
ON-ORBIT SPACECRAFT/STAGE SERVICING DURING STS LIFE CYCLE Final Report
27 Jan. 1984 140 p refs
(Contract NAS9-15800)
(NASA-CR-171775; NAS 1.26:171775; LMSC-D931673) Avail: NTIS HC A07/MF A01 CSCL 22B

A comprehensive and repesentative set of shuttle payloads was identified for shuttle and space station servicing missions. The classes of servicing functions were determined and the general servicing support required for the set of referenced spacecraft was allocated. A candidtate strawman space station was depicted from a synthesis of space station concepts derived from NASA space station architecture studies done by eight contractors. The shuttle servicing hardware and kits were identified and their applicability in transitioning servicing capability to the space station was evaluated. A.R.H.

N84-20618*# Raven Industries, Inc., Sioux Falls, S. Dak. Applied Technology Div.
SPACE SHUTTLE INFLATABLE TRAINING ARTICLES Final Report
Mark L. West 20 Feb. 1984 102 p
(Contract NAS9-16854)
(NASA-CR-171761; NAS 1.26:171761; R0184-002) Avail: NTIS HC A06/MF A01 CSCL 14B

The design, development, construction, and testing of the Long Duration Exposure Facility inflatable and the space telescope training articles are discussed. While these articles are of similar nature, materials, and construction, they vary in size and present different problems with regards to size, shape, gross/net lift, and balance. A.R.H.

N84-20619* Raven Industries, Inc., Sioux Falls, S. Dak.
SPACE SHUTTLE INFLATABLE TRAINING ARTICLES. APPENDICES D AND I: DRAWINGS Final Report
[1984] 732 p
(Contract NAS9-16854)
(NASA-CR-171762; NAS 1.26:171762; R0184-002) Avail: Issuing Activity CSCL 14B

Drawings are presented for the Long Duration Exposure Facility inflatable and for the space telescope training articles. A.R.H.

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications.*

N84-20620# New Mexico State Univ., Las Cruces. Lab. for Physical Science.
DEVELOPMENT OF A NON-VOLATILE PROGRAMMABLE DIGITAL TO ANALOG CONVERTER SUBSYSTEM FOR PCM (PULSE-CODE MODIFICATION) TELEMETRY SYSTEMS
Warren B. Harkey and Victor Parkerson 24 Oct. 1983 17 p
(Contract F19628-82-C-0111; AF Proj. 7659)
(AD-A137878; PSL-PD01038; AFGL-TR-83-0199; SR-1) Avail: NTIS HC A02/MF A01 CSCL 09/6

This report describes the development of a programmable digital to analog converter system with a non-volatile memory that expedites the acquisition of certain telemetry data received from sounding rockets. Author (GRA)

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support.* For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics.*

N84-20621 Purdue Univ., Lafayette, Ind.
ANALYSIS OF LARGE SPACE STRUCTURES Ph.D. Thesis
Serge Abrate 1983 182 p
Avail: Univ. Microfilms Order No. DA8400322

Typically, large space structures are latticed beams or plates made up of a very large number of elements assembled in a periodic pattern with overall dimensions possibly measured in miles. Efficient dynamic models are needed for design optimization, and control problems. Harmonic wave propagation analysis is used to determine the limits of applicability of the simple continuum models. Several equivalent continuum models are developed and evaluated comparatively. The range of validity of these continuum models is established in terms of wavelength. The presence of modes which are not predicted by the simple models is detected by considering a typical cell of the original structure. Procedures for including damping in the simple models are presented. Viscous, hysteretic, and a three parameter type damping models are discussed. The analysis of geometrically nonlinear trusses is performed, and the continuum beam models are shown to be efficient and accurate for both static and dynamic problems. Dissert. Abstr.

N84-20622*# Vought Corp., Dallas, Tex.
FLEXIBLE RADIATOR THERMAL VACUUM TEST REPORT
J. A. Oren and C. W. Hixon 29 Oct. 1982 103 p refs
(Contract NAS9-14776)
(NASA-CR-171764; NAS 1.26:171764; Rept-2-32300/IR-03) Avail: NTIS HC A06/MF A01 CSCL 22B

Two flexible, deployable/retraction radiators were designed and fabricated. The two radiator panels are distinguishable by their mission life design. One panel is designed with a 90 percent probability of withstanding the micrometeoroid environment of a low earth orbit for 30 days. This panel is designated the soft tube radiator after the PFA Teflon tubes which distribute the transport fluid over the panel. The second panel is designed with armored flow tubes to withstand the same micrometeoroid environment for 5 years. It is designated the hard tube radiator after its stainless steel flow tubes. The thermal performance of the radiators was tested under anticipated environmental conditions. The two deployment systems of the radiators were evaluated in a thermal vacuum environment. S.L.

N84-20623*# Vought Corp., Dallas, Tex.
FLEXIBLE RADIATOR SYSTEM
J. A. Oren 30 Oct. 1982 82 p refs
(Contract NAS9-14776)
(NASA-CR-171765; NAS 1.26:171765; Rept-2-19200/3R-1195B) Avail: NTIS HC A05/MF A01 CSCL 22B

The soft tube radiator subsystem is described including applicable system requirements, the design and limitations of the subsystem components, and the panel manufacturing method. The soft tube radiator subsystem is applicable to payloads requiring 1 to 12 kW of heat rejection for orbital lifetimes per mission of 30 days or less. The flexible radiator stowage volume required is about 60% and the system weight is about 40% of an equivalent heat rejection rigid panel. The cost should also be considerably less. The flexible radiator is particularly suited to shuttle orbiter sortie payloads and also whose mission lengths do not exceed the 30 day design life. A.R.H.

N84-20624*# Vought Corp., Dallas, Tex.
FLEXIBLE RADIATOR SYSTEM: EXECUTIVE SUMMARY
John R. Oren and Roy L. Cox 30 Oct. 1982 49 p
(Contract NAS9-14776)
(NASA-CR-171766; NAS 1.26:171766; Rept-2-19200/3R-1062B) Avail: NTIS HC A03/MF A01 CSCL 22B

A full scale prototype flexible radiator panel was designed, built and tested. The panel, has approximately 173 sq ft of radiating area and is designed to reject 1.33 kW of heat to a 0 F sink with a 100 F fluid inlet. The panel is constructed from a flexible Teflon/silver mesh fin surrounding 1/8 inch Teflon tubes. The prototype panel is stowed on a 10 inch diameter by 4 foot wide drum. (It rolls up to a diameter of 17 inches when fully stowed). Deployment of the soft tube prototype is via two four inch diameter Kevlar/Mylar inflation tubes with flat springs incorporated in each tube. Nitrogen is normally used for the deployment with approximately 1 psi required. The springs retract the panels when the inflation tubes are deflated. Another method of deployment available for the soft tube flexible is a motor driven deployable boom. This eliminates the need for expendables when the panel area is varied during the mission for heat load control. The soft tube panel is designed for a 90% probability of no punctured tube in a 30 day mission. The acceptable working fluids for this soft tube flexible are Coolanol 15, Coolanol 20 and Glycol/water (a eutectic mixture). S.L.

N84-20625*# Bendix Corp., Teterboro, N. J. Guidance Systems Div.
EXHIBIT D MODULAR DESIGN ATTITUDE CONTROL SYSTEM STUDY Progress Report, Jan. - Feb. 1984
F. Chichester Feb. 1984 69 p refs
(Contract NAS8-33979)
(NASA-CR-170993; NAS 1.26:170993) Avail: NTIS HC A04/MF A01 CSCL 22B

A dynamically equivalent four body approximation of the NASTRAN finite element model supplied for hybrid deployable truss to support the digital computer simulation of the ten body model of the flexible space platform that incorporates the four body truss model were investigated. Coefficients for sensitivity of state variables of the linearized model of the three axes rotational dynamics of the prototype flexible spacecraft were generated with respect to the model's parameters. Software changes required to accomodate addition of another rigid body to the five body model of the rotational dynamics of the prototype flexible spacecraft were evaluated. S.L.

N84-20626*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONSTRUCTION CONCEPT FOR ERECTING AN OFFSET-FED ANTENNA
Marvin D. Rhodes Mar. 1984 20 p refs
(NASA-TM-85774; NAS 1.15:85774) Avail: NTIS HC A02/MF A01 CSCL 22B

A design concept for the construction of an offset-fed antenna is discussed. Antennas of this type are of interest for space applications because the configuration eliminates the effects of feed and feed-support blockage. The proposed construction concept is developed around the assembly of a stiff truss substructure by pressure-suited astronauts operating in extravehicular activity (EVA) assisted by a mobile platform that moves along the structure to position the astronauts at joint locations where they can latch members in place. Construction can be accomplished from the shuttle cargo bay in the course of a normal flight or from a space station platform. The concepts demonstrates the versatility of machine assisted manned assembly and is only one of many potential applications. Author

N84-20627*# Howard Univ., Washington, D. C. Dept. of Mechanical Engineering.
ENVIRONMENTAL EFFECTS ON THE DYNAMICS AND CONTROL OF AN ORBITING LARGE FLEXIBLE ANTENNA SYSTEM
R. Krishna and Peter M. Bainum 1984 10 p refs Proposed for Presentation at the 35th Intern. Astronautical Congr., Lausanne, Switzerland, 7 - 13 Oct. 1984
(Grant NsG-1414)

(NASA-CR-175448; NAS 1.26:175448) Avail: NTIS HC A02/MF A01 CSCL 22B

Solar radiation pressure on the vibrating antenna structure, temperature gradients induced by solar heating, and stabilizing gravity-gradient torques were considered when the linear regulator theory was used to obtain orientation and shape control of a hoop/column antenna system being considered for the land mobile satellite system. A finite element model of the antenna system which includes all six rigid modes and seven flexible modes was used. Results show that the environmental disturbances affect only the rigid modes of the structure. The effect of solar radiation pressure interacting with the vibrating system is smaller than the solar radiation pressure acting on the thermally deformed structure. To reduce control effort in order to maintain shape and orientation, thermal deformations must be minimized in the preliminary design of the system. A.R.H.

N84-20628*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

AEROSPACE VEHICLE Patent Application

L. Robert Jackson and Allan H. Taylor, inventors (to NASA) Filed 9 Jan. 1984 17 p

(NASA-Case-LAR-13155-1; US-Patent-Appl-SN-569371) Avail: NTIS HC A02/MF A01 CSCL 22B

A dual structure aerospace vehicle has an aeroshell structure and an internally disposed separable and reusable integral tank/thrust structure. The tank/thrust structure is insulated for cryogenic fuels and the cavity within aeroshell is insulated from the tank/thrust structure. An internal support ring within the cavity serves as an attachment for lugs on the tank/thrust structure via double hinges. The aft end of tank/thrust structure is provided with rocket engines and exit nozzles with a trunnion supporting the tank/thrust structure within the aeroshell. NASA

N84-20629# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

AN ITERATIVE GUIDANCE METHOD FOR THE LARGE ROCKET LAUNCH VEHICLE

Z. Han 13 Jan. 1984 28 p Transl. into ENGLISH from Yuhang Xuebao (China), no. 1, 1983 p 9-21

(AD-A137586; FTD-ID(RS)T-1811-83) Avail: NTIS HC A03/MF A01 CSCL 17/7

The rapid control problem for a rocket launch vehicle, is investigated by introducing and applying an optimum control theory and derives a path adaptive guidance method which satisfies the space guidance requirements--the iterative guidance method. The basic concepts and basic conclusion of this method are described and a set of approximate guidance formulae are provided. An iterative guidance method is introduced in conjunction with the launching of Earth satellites. The operational procedure of the iterative guidance method and the guidance accuracy obtained from analogue model computation are also presented. The results show that the accuracy of the iterative guidance method is much higher than that of the Delta minimum guidance method. It can be concluded that this method can be widely used in guiding rocket launch vehicles. S.L.

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography.*

N84-20630*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

A STUDY OF A SPACE-STATION-ASSOCIATED MULTIPLE SPACECRAFT MICHELSON SPATIAL INTERFEROMETER Final Report, 24 Mar. - 30 Sep. 1983

Robert V. Stachnik Sep. 1983 50 p refs

(Contract NASw-3755)

(NASA-CR-175438; NAS 1.26:175438) Avail: NTIS HC A03/MF A01 CSCL 14B

One approach to Michelson spatial interferometry at optical wavelengths involves use of an array of spacecraft in which two widely-separated telescopes collect light from a star and direct it to a third, centrally-located, device which combines the beams in order to detect and measure interference fringes. The original version of a spacecraft array for Michelson spatial interferometry (SAMSI) was modified so that the system uses the fuel resupply capability of a space station. The combination of this fuel resupply capability with a method of obtaining image Fourier transform phase information, necessary for full image reconstruction, permits SAMSI to be used to synthesize images equivalent to those produced by huge apertures in space. Synthesis of apertures in the 100 to 500 meter range is discussed. Reconstruction can be performed to a visual magnitude of at least 8 for a 100 A passband in 9 hours. Data are simultaneously collected for image generation from 0.1 micron to 18 microns. In the one-dimensional mode, measurements can be made every 90 minutes (including acquisition and repointing time) for objects as faint as 19th magnitude in the visible. A.R.H.

N84-20819# Nebraska Univ., Lincoln. Dept. of Engineering Mechanics.

AN ANGULAR VELOCIMETER FOR AEROSPACE APPLICATIONS

P. W. Whaley *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 190-215 refs (For primary document see N84-20809 11-35)

(AD-P002682) Avail: NTIS HC A99/MF A01 CSCL 14/2

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N84-20631*# Texas A&M Univ., College Station. Turbomachinery Lab.

SSME INTERSTAGE SEAL RESEARCH Progress Report

Dara W. Childs Jan. 1984 86 p refs

(Contract NAS8-33716)

(NASA-CR-170995; NAS 1.26:170995; RD-1-84) Avail: NTIS HC A05/MF A01 CSCL 21H

Test results comprising direct and transverse force coefficients and leakage coefficients are reported for six seal configurations. All seals tested use the same smooth rotor and have the same constant minimum clearance. The following stator configurations were tested: (1) Smooth, (2) knurled pattern, (3) axially-grooved pattern with end seals, (4) diamond-grid roughened, (5) diamond-grid roughened with end seals, and (6) round-hole pattern. Comparison of the seals shows the Knurled-pattern stator to be the stiffest and the round-hole pattern stator to yield the largest net damping and the least leakage. The theory of reference is shown to substantially underestimate the stiffness and effective-added-mass coefficients, but do a reasonable job in predicting the net-damping-force coefficient. S.L.

N84-20632*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

TEST BED ION ENGINE DEVELOPMENT Final Report, Sep. 1982 - Nov. 1983

Graeme Aston and William D. Deininger Mar. 1984 79 p refs

(Contract NAS7-918)

(NASA-CR-174623; NAS 1.26:174623) Avail: NTIS HC A05/MF A01 CSCL 21C

A test bed ion (TBI) engine was developed to serve as a tool in exploring the limits of electrostatic ion thruster performance. A description of three key ion engine components, the decoupled extraction and amplified current (DE-AC) accelerator system, field

enhanced refractory metal (FERM) hollow cathode and divergent line cusp (DLC) discharge chamber, whose designs and operating philosophies differ markedly from conventional thruster technology is given. Significant program achievements were: (1) high current density DE-AC accelerator system operation at low electric field stress with indicated feasibility of a 60 mA/sq cm argon ion beam; (2) reliable FERM cathode start up times of 1 to 2 secs. and demonstrated 35 ampere emission levels; (3) DLC discharge chamber plasma potentials negative of anode potential; and (4) identification of an efficient high plasma density engine operating mode. Using the performance projections of this program and reasonable estimates of other parameter values, a 1.0 Newton thrust ion engine is identified as a realizable technology goal. Calculations show that such an engine, comparable in beam area to a J series 30 cm thruster, could, operating on Xe or Hg, have thruster efficiencies as high as 0.76 and 0.78 respectively, with a 100 eV/ion discharge loss. M.A.C.

N84-20633# Aeronautical Research Labs., Melbourne (Australia).
A PARAMETRIC STUDY OF RAMROCKET PERFORMANCE
Lincoln Erm Apr. 1983 24 p refs
(ARL-MECH-ENG-Note-395; AR-002-949) Avail: NTIS HC A02/MF A01

The performance of a ramrocket having conventional solid propellant is calculated for a range of chosen operating conditions. The geometry of the ramrocket is allowed to vary to suit the flow conditions assumed. Both constant area and constant pressure mixing and combustion are considered. Performance curves in terms of thrust augmentation ratio are presented. Author

N84-20634*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF PROPELLANT TANK INSULATION CONCEPTS FOR LOW-THRUST CHEMICAL PROPULSION SYSTEMS Final Report
T. Kramer, E. Brogren, and B. Seigel Mar. 1984 257 p refs
(Contract NAS3-22824)
(NASA-CR-168320; NAS 1.26:168320; BAC-D180-28273-1) Avail: NTIS HC A12/MF A01 CSCL 21H

An analytical evaluation of cryogenic propellant tank insulations for liquid oxygen/liquid hydrogen low-thrust 2224N (500 lbf) propulsion systems (LTPS) was conducted. The insulation studied consisted of combinations of N2-purged foam and multilayer insulation (MLI) as well as He-purged MLI-only. Heat leak and payload performance predictions were made for three Shuttle-launched LTPS designed for Shuttle bay packaged payload densities of 56 kg/cu m, 40 kg/cu m and 24 kg/cu m. Foam/MLI insulations were found to increase LTPS payload delivery capability when compared with He-purged MLI-only. An additional benefit of foam/MLI was reduced operational complexity because Orbiter cargo bay N2 purge gas could be used for MLI purging. Maximum payload mass benefit occurred when an enhanced convection, rather than natural convection, heat transfer was specified for the insulation purge enclosure. The enhanced convection environment allowed minimum insulation thickness to be used for the foam/MLI interface temperature selected to correspond to the moisture dew point in the N2 purge gas. Experimental verification of foam/MLI benefits was recommended. A conservative program cost estimate for testing a MLI-foam insulated tank was 2.1 million dollars. It was noted this cost could be reduced significantly without increasing program risk. Author

N84-20635*# Lockheed Missiles and Space Co., Huntsville, Ala.
SPACE SHUTTLE MAIN ENGINE POWERHEAD STRUCTURAL MODELING, STRESS AND FATIGUE LIFE ANALYSIS. VOLUME 1: GASDYNAMIC ENVIRONMENT OF THE SSME HPFTP AND HPOTP TURBINES Final Report
J. C. Hammett, C. H. Hayes, J. M. Price, J. K. Robinson, G. A. Teal, J. M. Thomson, D. M. Tilley, and C. T. Welch Dec. 1983 169 p 4 Vol.
(Contract NAS8-34978)
(NASA-CR-170999; NAS 1.26:170999;
LMSC-HREC-TR-D867333-I) Avail: NTIS HC A08/MF A01 CSCL 21H

Gasdynamic analysis for the turbine blades and nozzle vanes, HPFTP turbine analysis, and HPOTP turbine analysis are provided. N.W.

N84-20636*# Lockheed Missiles and Space Co., Huntsville, Ala.
SPACE SHUTTLE MAIN ENGINE POWERHEAD STRUCTURAL MODELING, STRESS AND FATIGUE LIFE ANALYSIS. VOLUME 2: DYNAMICS OF BLADES AND NOZZLES SSME HPFTP AND HPOTP Final Report
J. C. Hammett, C. H. Hayes, J. M. Price, J. K. Robinson, G. A. Teal, J. M. Thomson, D. M. Tilley, and C. T. Welch Dec. 1983 130 p 4 Vol.
(Contract NAS8-34978)
(NASA-CR-171000; NAS 1.26:171000;
LMSC-HREC-TR-D867333-II) Avail: NTIS HC A07/MF A01 CSCL 21H

Normal modes of the blades and nozzles of the HPFTP and HPOTP are defined and potential driving forces for the blades are identified. The computer models used in blade analyses are described, with results. Similar information is given for the nozzles. Author

N84-20637*# Lockheed Missiles and Space Co., Huntsville, Ala.
SPACE SHUTTLE MAIN ENGINE POWERHEAD STRUCTURAL MODELING, STRESS AND FATIGUE LIFE ANALYSIS. VOLUME 3: STRESS SUMMAY OF BLADES AND NOZZLES AT FPL AND 115 PERCENT RPL LOADS. SSME HPFTP AND HPOTP BLADES AND NOZZLES Final Report
J. C. Hammett, C. H. Hayes, J. M. Price, J. K. Robinson, G. A. Teal, J. M. Thomson, D. M. Tilley, and C. T. Welch Dec. 1983 443 p 4 Vol.
(Contract NAS8-34978)
(NASA-CR-171001; NAS 1.26:171001;
LMSC-HREC-TR-D867333-III) Avail: NTIS HC A19/MF A01 CSCL 21H

Gasdynamic environments applied to the turbine blades and nozzles of the HPFTP and HPOTP were analyzed. Centrifugal loads were applied to blades to account for the pump rotation of FPL and 115 percent RPL. The computer models used in the blade analysis with results presented in the form of temperature and stress contour plots are described. Similar information is given for the nozzles. Author

N84-20638*# Lockheed Missiles and Space Co., Huntsville, Ala.
SPACE SHUTTLE MAIN ENGINE, POWERHEAD STRUCTURAL MODELING, STRESS AND FATIGUE LIFE ANALYSIS. VOLUME 4: SUMMARY OF INVESTIGATION OF UNSCHEDULED EVENTS AND SPECIAL TASKS Final Report
J. K. Robinson, G. A. Teal, and C. T. Welch Dec. 1983 53 p 4 Vol.
(Contract NAS8-34978)
(NASA-CR-171002; NAS 1.26:171002;
LMSC-HREC-TR-D867333-IV) Avail: NTIS HC A04/MF A01 CSCL 21H

Low pressure fuel turbopump turbine labyrinth send tip rubbing analysis, gas dynamic analysis, and HPFTP blade crack and blade impact are presented. N.W.

N84-20639*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PARAMETRIC ANALYSIS OF HOLLOW CONDUCTOR PARALLEL AND COAXIAL TRANSMISSION LINES FOR HIGH FREQUENCY SPACE POWER DISTRIBUTION
Kent S. Jeffries and David D. Renz Mar. 1984 43 p refs
(NASA-TM-83601; E-2013; NAS 1.15:83601) Avail: NTIS HC A03/MF A01 CSCL 09C

A parametric analysis was performed of transmission cables for transmitting electrical power at high voltage (up to 1000 V) and high frequency (10 to 30 kHz) for high power (100 kW or more) space missions. Large diameter (5 to 30 mm) hollow conductors were considered in closely spaced coaxial configurations and in parallel lines. Formulas were derived to calculate inductance and resistance for these conductors. Curves of cable

conductance, mass, inductance, capacitance, resistance, power loss, and temperature were plotted for various conductor diameters, conductor thickness, and alternating current frequencies. An example 5 mm diameter coaxial cable with 0.5 mm conductor thickness was calculated to transmit 100 kW at 1000 Vac, 50 m with a power loss of 1900 W, an inductance of 1.45 micron and a capacitance of 0.07 micron-F. The computer programs written for this analysis are listed in the appendix. Author

N84-20640# Ogden Air Logistics Center, Hill AFB, Utah. Component and Combustion Test Unit.
QUALIFICATION OF A NEW MAPO SOURCE AND ERL-510 CURING AGENT FOR MINUTEMAN STAGE I UF-2121 LINER Semiannual Report
John A. Thompson Jan. 1984 24 p
(AD-A137539; AD-E301319; MANPA-NR-492(84)) Avail: NTIS HC A02/MF A01 CSCL 19/7

Thiokol Chemical Corporation/Wasatch Division uses MAPO in the production of UF-2121 liner. Thiokol changed MAPO vendors and, therefore, qualification of the new source MAPO was required. Thiokol prepared specimens from the new source and also specimens from the original source which are to be used as the control material in the 10 year surveillance testing program. The specimens were transferred to Ogden ALC for testing and reporting of the data obtained. This report includes the test results for the first through the eighth time testing of the control and special specimens at Ogden ALC. Statistical analysis of the test data showed that the physical properties of the new source compared closely to the old source of UF-2121 liner specimens. In all instances, the mean data for the control and special specimens are well above the minimum requirements found in TWR-7857 REV A, Thiokol specimen data. Therefore, the capability of the linear from the new source material is expected to perform satisfactorily. Author (GRA)

N84-20641# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
AFRPL (AIR FORCE ROCKET PROPULSION LABORATORY) TECHNICAL OBJECTIVE DOCUMENT FY 1985
R. L. Wiswell Oct. 1983 89 p Supersedes AFRPL-TR-82-094, AD-A125495
(AD-A137856; AFRPL-TR-83-062; AFRPL-TR-82-094) Avail: NTIS HC A05/MF A01 CSCL 21/8

This report is a summary of technical objectives and approaches for research, exploratory development and advanced development efforts being pursued and to be pursued at the Air Force Rocket Propulsion Laboratory between FY 83-89. Research topics include: solid rocket motors, solid propellants, liquid rockets, combustion and rocket plumes. GRA

N84-20642# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A CALCULATION OF DESCENT SEGMENT OF INTERNAL BALLISTICS IN SOLID ROCKET MOTORS
Fang Dingyou 5 Jan. 1984 16 p Transl. into ENGLISH from Yuhang Xuebao (China), vol. 1, no. 1, 1983 p 29-36
(AD-A137199; FTD-ID(RS)T-1819-83) Avail: NTIS HC A02/MF A01 CSCL 21/8

The precise prediction of the after-working impulse of solid rocket motors is very important for the prediction of missile and motor performance. The characteristic method is used to consider the changes of gaseous parameters along the combustion chamber length and to calculate the descent segment of internal ballistics in solid rocket motors. The gaseous parameters in the descent segment along the combustion chamber length which change with time are given and the calculation results of the characteristic method and isentropic model are compared. M.G.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N84-20643*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HOMOGENEOUS REACTIONS OF HYDROCARBONS, SILANE, AND CHLOROSILANES IN RADIOFREQUENCY PLASMAS AT LOW PRESSURES
Reuven Avni, Uzi Carmi (Nuclear Research Center Negev, Beer Sheva, Israel), Aron Inspektor (Nuclear Research Center Negev, Beer Sheva, Israel), and Ionel Rosenthal (Nuclear Research Center Negev, Beer Sheva, Israel) Apr. 1984 13 p refs Presented at the 6th Intern. Symp. on Plasma Chem., Montreal, 24-28 Jul. 1983; sponsored by International Union of Pure and Applied Chemistry
(NASA-TP-2301; E-1919; NAS 1.60:2301) Avail: NTIS HC A02/MF A01 CSCL 07A

The ion-molecule and radical-molecule mechanisms are responsible for the dissociation of hydrocarbon, silane, and chlorosilane monomers and the formation of polymerized species, respectively, in an RF plasma discharge. In a plasma containing a mixture of monomer and argon the rate-determining step for both dissociation and polymerization is governed by an ion-molecule type of interaction. Adding hydrogen or ammonia to the monomer-argon mixture transforms the rate-determining step from an ion-molecule interaction to a radical-molecule interaction for both monomer dissociation and polymerization. Author

N84-20644# California Univ., Livermore. Lawrence Livermore Lab.
VACUUM OUTGASSING OF VARIOUS MATERIALS
E. D. Erikson, T. G. Beat, D. D. Berger, and B. A. Frazier 20 Dec. 1983 21 p refs Presented at the Am. Vacuum Soc. Symp., Boston, 24-28 Oct. 1983
(Contract W-7405-eng-48)
(DE84-004812; UCRL-89299-Rev-1; CONF-831011-3-Rev-1) Avail: NTIS HC A02/MF A01

A gas analytical system for measuring the evolved gases from materials during vacuum degassing is discussed. The outgassing data are based upon the throughput measurement and a computer-controlled quadrupole mass spectrometer allows the determination of residual gas species. A variety of materials were tested in the as received condition at room temperature vacuum exposure. Test results are presented for materials such as chlorinated polyvinylchloride (CPVC); low-density carbon foam and Monel knitted wire mesh (both of which could be used for the attenuation of electromagnetic or radio frequency interference); polyethylene (in the form of black pipe, a sheet of various thicknesses, and as an electrostatistically applied coating to metal substrates); as well as Parylene-N conformal coatings applied to CPVC, polyethylene, and stainless steel substrates. DOE

24 COMPOSITE MATERIALS

Includes laminates.

N84-20645 Cornell Univ., New York, N.Y.
RECURSION FORMULAS AND LIMIT THEOREMS FOR THE LIFETIME DISTRIBUTION OF A MODEL FIBROUS COMPOSITE Ph.D. Thesis
Chia-Chyuan Kuo 1983 210 p
Avail: Univ. Microfilms Order No. DA8328645

A fibrous composite is a parallel arrangement of brittle fibers impregnated with a flexible matrix. This thesis is concerned with probabilistic models of the micromechanical failure process in such composites for purposes of evaluating their long-term reliability in structural applications. An idealization is considered wherein the composite consists of n parallel filaments arranged in a plane. The composite is conceptually partitioned into a series of m short

sections called bundles, and these are taken to be statistically and structurally independent; thus the lifetime of the composite is that of the first bundle to fail. Within each bundle the surviving and failed fiber elements share load according to a local load-sharing rule wherein the load of a failed fiber is shifted laterally onto nearby survivors. For the failure of single fiber elements, a lifetime model is considered. The model has a memory integral, power-law dependence of lifetime on load level, and a Weibull shape function which imparts Weibull features to distributions for fiber strength and lifetime. To simulate chopped fiber composites, a fiber element also has a probability of being initially broken.
Dissert. Abstr.

N84-20646 Stanford Univ., Calif.
SH WAVE PROPAGATION IN A LAMINATED COMPOSITE Ph.D. Thesis
Gary Scott Beaupre 1983 167 p
Avail: Univ. Microfilms Order No. DA8329688

The propagation of SH waves through a composite material consisting of two homogeneous isotropic, linearly elastic materials arranged in an alternating fashion is analyzed. The layers are considered to be perfectly bonded at their interfaces. A comprehensive description of SH waves propagating at an arbitrary angle through an infinite, periodically layered solid is presented. Throughout this treatment, an attempt is made to compare and contrast the response of the composite body to more simple systems. It is shown that the concept of dispersion plays a crucial role in the response of the layered composites. The dispersion relation is obtained by making use of the equations of classical elasticity and applying Floquet's theory of differential equations with periodic coefficients. Since the dispersion equation involves two independent wave numbers, it can be represented as a surface in frequency wave number space. Dissert. Abstr.

N84-20647*# George Washington Univ., Washington, D.C.
TERRESTRIAL WHISKER GROWTH EXPERIMENTS WHICH ANTICIPATE SOME SPECIAL EFFECTS OF A SPACE STATION ENVIRONMENT Final Report
Herman H. Hobbs 1983 21 p
(NASA-CR-175440; NAS 1.26:175440) Avail: NTIS HC A02/MF A01 CSCL 11D

The effects of the absence of gravitationally driven thermal convection on the growth of whiskers by chemical reduction of metal salts was studied. It was possible to accomplish nearly complete suppression of such convection. Suppression of the convection does indeed effect the growth but in subtle, not necessarily detrimental ways: none of the changes observed were such as to hamper efforts to produce whiskers in space. Copper whiskers grown from cuprous iodide respond most positively to the suppression of convection; therefore, they are strongly recommended for tests in the space environment. Cobalt whiskers grown from cobaltous bromide show the greatest independence from conditions of convection and applied electric fields of any material studied; therefore, this medium is highly recommended. A strong pulse of electric field forces the whiskers to stick to the growth vessel top plate, this facilitates study or 'harvesting'. On the space station it is recommended that the growth vessels be mounted outside the laboratory and joined with the station by means of double vacuum valves and gas service lines. M.A.C.

N84-20648*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
FRACTURE BEHAVIOR OF THICK, LAMINATED GRAPHITE/EPOXY COMPOSITES
C. E. Harris and D. H. Morris Mar. 1984 188 p refs
(Grant NAG1-264)
(NASA-CR-3784; NAS 1.26:3784) Avail: NTIS HC A09/MF A01 CSCL 11D

The effect of laminate thickness on the fracture behavior of laminated graphite epoxy (T300/5208) composites was studied. The predominantly experimental research program included the study of the [0/+ or - 45/90 sub ns] and [0/90 sub ns] laminates with thickness of 8, 32, 64, 96 and 120 plies and the [0/+ or - 45 sub ns] laminate with thickness of 6, 30, 60, 90 and 120 plies. The research concentrated on the measurement of fracture toughness utilizing the center-cracked tension, compact tension and three point bend specimen configurations. The development of subcritical damage at the crack tip was studied nondestructively using enhanced X-ray radiography and destructively using the laminate deply technique. The test results showed fracture toughness to be a function of laminate thickness. The fracture toughness of the [0 + or - 45/90 sub ns] and [0/90 sub ns] laminates decreased with increasing thickness and asymptotically approached lower bound values of 30 ksi square root of in. (1043 MPa square root of mm and 25 ksi square root of in (869 MPa square root of mm respectively. In contrast to the other two laminates, the fracture toughness of the [0/+ or - 45 sub ns] laminate increased sharply with increasing thickness but reached an upper plateau value of 40 ksi square root of in (1390 MPa square root of mm) at 30 plies. Fracture toughness was independent of crack size for both thin and thick laminates for all three laminate types except for the [0/90 sub 2s] laminate which spilt extensively. The center cracked tension, three point bend and compact tension specimens gave comparable results. S.L.

N84-20649*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMPROVED IMPACT TOLERANT MATERIAL
Joseph S. Heyman, inventor (to NASA) 22 Feb. 1984 12 p
(NASA-Case-LAR-12887-1; US-Patent-Appl-SN-582493) Avail: NTIS HC A02/MF A01 CSCL 11D

A material design is proposed whereby the material is protected from acoustic shock waves generated by impacting projectiles by means of a backing. The backing has an acoustic impedance that efficiently couples the acoustic energy out of the material.
NASA

N84-20650*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECT OF IMPACT DAMAGE AND OPEN HOLES ON THE COMPRESSION STRENGTH OF TOUGH RESIN/HIGH STRAIN FIBER LAMINATES
Jerry G. Williams Feb. 1984 21 p refs Presented at Tough Mater. Composite Workshop, Hampton, Va., 24-26 May 1983
(NASA-TM-85756; NAS 1.15:85756) Avail: NTIS HC A02/MF A01 CSCL 11D

Structural damage and design-based inclusions such as cutouts can reduce significantly the strength of graphite-epoxy laminates. One composite mechanics research activity at the Langley Research Center is to assess and improve the performance of composite structures in strength are common to both tension and compression loaded laminates; however, the problem associated with compression performance is the most illusive to solve. Compression failure involves both shear crippling and delamination modes. Several graphite-epoxy material systems proposed for improved damage-tolerance were studied. Material parameters included both tough resin formulations and high strain fibers.
Author

N84-20651# Stanford Univ., Calif. Dept. of Materials Science and Engineering.
SUPERPLASTIC BONDING AND ULTRAHIGH CARBON STEEL LAMINATED COMPOSITES Final Report, Sep. 1979 - Sep. 1983
Oleg D. Sherby, Dong Wha Kum, Jeffrey Wadsworth, and Barry C. Snyder 15 Dec. 1983 6 p
(Contract DAAG29-79-C-0190)
(AD-A137807; SU-DMS-78-P-21; ARO-16850.2-MS) Avail: NTIS HC A02/MF A01 CSCL 13/8

Ferrous laminated composites based on ultrahigh carbon (UHC) steel have been successfully manufactured by rolling bonding below the A1 transition temperature. This procedure results in the development of sharp and discrete layer boundaries since no interdiffusion occurs during rolling. Good bonding is achieved because of the presence of ultrafine grains in the UHC steel. Mechanical properties of the composites have been evaluated for

their charpy V-notch impact properties and for their superplastic characteristics. An extremely low ductile-to-brittle transition temperature, and very high shelf energies have been found both for ferrous laminated composites and for UHC steel laminates. This remarkably good behavior is shown to be a result of notch blunting within the laminates as a result of delamination. If the interlayer strength is improved by heat treatment, delamination does not take place and the impact properties are degraded. The mechanical properties of a ferrous laminated composite consisting of alternating layers of a superplastic UHC steel and non-superplastic I.F. iron, have been studied at intermediate temperatures. Superplastic behavior was approached in the laminated composite with values of the strain rate sensitivity exponent of as high as 0.3 measured and maximum tensile elongation of 430% achieved. GRA

N84-20652# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF THE VLS PROCESS FOR SiC WHISKER GROWTH
G. F. Hurley 1984 20 p Presented at the 6th Ann. Discontinuously Reinforced Metal Matrix Composite Coordination Working Group Meeting, Park City, Utah, 4 Jan. 1984
(Contract W-7405-eng-36)
(DE84-004376; LA-UR-83-3717; CONF-840136-1) Avail: NTIS HC A02/MF A01

This work involves preparation of whisker samples, whisker characterization, and process scaleup. Sample whiskers are used for composite preparation and for whisker characterization work, while modelling of the production process is itself proving useful. The approach to scaleup recognizes the importance of a full understanding of the process variables. Hence the work in this area is proceeding with studies of the chemistry of the process gases and investigation of the growth mechanism. DOE

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics.*

N84-20653# National Inst. for Water Research, Pretoria (South Africa).
A LABORATORY MANUAL FOR THE DETERMINATION OF METALS IN WATER AND WASTEWATER BY ATOMIC ABSORPTION SPECTROPHOTOMETRY
R. Smith 1983 36 p refs
(CSIR-Tech-Guide-K63; ISBN-0-7988-2482-4) Avail: NTIS HC A03/MF A01

The basic principles and practical aspects of atomic absorption spectrophotometry are discussed. A scheme of analysis for determination of 19 metals in water and wastewater, 16 by flame atomic absorption and 3 by vapor generation techniques are given. Simplicity, speed, and accuracy were the main criteria considered in the selection of the various methods. S.L.

N84-20654*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ABRASION BY AEOLIAN PARTICLES: EARTH AND MARS
R. Greeley (Arizona State Univ., Tempe), S. Williams (Santa Clara Univ., Calif.), B. R. White (California Univ., Davis), J. Pollack, J. Marshall (Arizona State Univ., Tempe), and D. Krinsley (Arizona State Univ., Tempe) Mar. 1984 55 p refs
(Contract NCC2-60; Grant NsG-2284)
(NASA-CR-3788; NAS 1.26:3788) Avail: NTIS HC A04/MF A01 CSCL 08G

Estimation of the rate of aeolian abrasion of rocks on Mars requires knowledge of: (1) particle flux, (2) susceptibilities to abrasion of various rocks, and (3) wind frequencies on Mars. Fluxes and susceptibilities for a wide range of conditions were obtained in the laboratory and combined with wind data from the Viking meteorology experiment. Assuming an abundant supply of sand-sized particles, estimated rates range up to 2.1 x 10 to the minus 2 power cm of abrasion per year in the vicinity of Viking Lander 1. This rate is orders of magnitude too great to be in agreement with the inferred age of the surface based on models of impact crater flux. The discrepancy in the estimated rate of abrasion and the presumed old age of the surface cannot be explained easily by changes in climate or exhumation of ancient surfaces. The primary reason is thought to be related to the agents of abrasion. At least some sand-sized (approx. 100 micrometers) grains appear to be present, as inferred from both lander and orbiter observations. High rates of abrasion occur for all experimental cases involving sands of quartz, basalt, or ash. However, previous studies have shown that sand is quickly comminuted to silt- and clay-sized grains in the martian aeolian regime. Experiments also show that these fine grains are electrostatically charged and bond together as sand-sized aggregates. Laboratory simulations of wind abrasion involving aggregates show that at impact velocities capable of destroying sand, aggregates from a protective veneer on the target surface and can give rise to extremely low abrasion rates. B.W.

N84-20655# Georgia Univ., Athens.
POLYPHOSPHORUS COMPOUNDS CONTAINING PHOSPHORUS-NITROGEN BONDS Final Report, 1 Jan. 1981 - 31 Dec. 1983
R. B. King Jan. 1984 15 p
(Grant AF-81-0051; AF Proj. 2303)
(AD-A137722; AFOSR-84-0091TR) Avail: NTIS HC A02/MF A01 CSCL 07/3

The original scientific objective of this basic research program was the understanding of the synthesis and chemical reactivity of organic compounds consisting of a carbon backbone containing several bis(dialkylamino) phosphino substituents, (R2N2)P. This class of organophosphorus compounds, which has received very little attention, is of potential importance as intermediates in the manufacture of materials of possible value to the Air Force in diverse applications including antioxidants, lubricity agents, elastomers, flame retardants, and fuel cell catalysts. The development of methods for the synthesis of organic compounds bearing several (R2N2)P substituents requires the availability of important dialklaminosphorus building blocks. In this connection major effects of the size of the dialkylamino group on the resulting dialkylaminophosphorus chemistry were documented for the first time. GRA

N84-20656# Naval Research Lab., Washington, D. C. Combustion Fuels Branch.
DRY CHEMICAL DEVELOPMENT: A MODEL FOR THE EXTINCTION OF HYDROCARBON FLAMES
C. T. Ewing (Hughes Associates, Inc., Kensington, Md.), J. T. Hughes (Hughes Associates, Inc., Kensington, Md.), and H. W. Carhart 8 Feb. 1984 32 p
(S15-65-SL)
(AD-A137952; NRL-MR-5267) Avail: NTIS HC A03/MF A01 CSCL 13/12

An empirical relation has been developed which correlates and predicts the suppression effectiveness of a wide variety of gaseous, liquid, and solid agents. The flame extinguishment model is based on the premise that extinction is dominated by heat absorption processes and that a flame is extinguished when sufficient heat has been removed by the extinguishment to reduce the temperature to a limit value. This limit is the minimum temperature at which the effective rate of the combustion reactions is sufficient to maintain flame propagation, and it depends in a predictable way on the properties of the suppressant and flame system. The heat-balance equation describing this is derived in two stages. In the first, a preliminary equation is obtained by considering only those substances which are thermally stable and act only as heat capacity sinks. In the second, the equation is generalized by consideration of all endothermic reaction sinks, e.g., vaporization, dissociation, and decomposition. The general equation correlates most of the extinction data found in the literature. The results suggest that for many substances the

extinguishing capacity is related to heat extraction and that many of the effects previously attributed to chemical mechanisms are thermodynamic in nature rather than kinetic. Author (GRA)

N84-20657# Westinghouse Research and Development Center, Pittsburgh, Pa.
FLUORESCENCE AND ELECTRON ENERGY LOSS CROSS SECTIONS IN MERCURIC BROMIDE Final Report, 17 Mar. - 31 Oct. 1983
P. J. Chantry and C. L. Chen 22 Dec. 1983 59 p
(Contract N00014-83-C-0240)
(AD-A137153; Rept-83-8C1-ELOSS-R1) Avail: NTIS HC A04/MF A01 CSCL 07/4

Computer modelling of HgBr discharge lasers requires as input the various cross sections for electron impact on HgBr2. This report describes measurements of the wavelength resolved emission cross section measured between 240 and 530 nm. This range encompasses three bands: The (D-X), (C-X) and B-X which have been documented and discussed previous. In addition we find a fourth band which appears on the long wavelength side of the (C-X) band, and overlaps the short wavelength tail of the (B-X) band. Measurements of the wavelengths at which local maxima appear in the fluorescence agree acceptably with Wielands' data on this band, which we designate as the (B'-X) band. A systematic approach to partitioning the spectrum between the various bands has been adopted in order to derive total band emission cross sections for all four bands. A more extensive series of measurements on the benchmark He line emission cross sections has led to a revised method of calibration the HgBr data. GRA

N84-20658# Ballistic Research Labs., Aberdeen Proving Ground, Md.
KINETIC MECHANISMS FOR PREMIXED, LAMINAR, STEADY STATE METHANE/AIR FLAMES Final Report
Terrence P. Coffee Dec. 1983 41 p
(DA Proj. 1L1-61102-AH-43)
(AD-A137263; AD-F300369; ARBRL-TR-02539) Avail: NTIS HC A03/MF A01 CSCL 21/2

A number of kinetic schemes have been used to model premixed, laminar, one-dimensional methane/air flames. Seven such kinetic schemes, including two new models, are compared with one another and with experimental data. The two new models, one with 14 species and one with 20 species, both agree with the experimental data over a range of stoichiometries from lean to rich. All of the models show good agreement for lean to slightly rich flames. This does not validate any of the models, even for this limited range. Rather, it is shown that the quantities measured are fairly insensitive to much of the mechanism. Therefore, models with incorrect kinetics can agree with the experimental data. In particular, the contribution of the C2 species to methane combustion is examined. While these species are important, we conclude that there is insufficient data to determine quantitatively the effects of the C2 chemistry reactions. GRA

N84-20659# Texas Univ., Austin.
DEVELOPMENT OF CATALYSTS FOR THE UTILIZATION OF CARBON MONOXIDE Final Report, 1 May 1981 - 31 Dec. 1982
Evan P. Kyba and R. Pettit 1983 6 p refs
(Grant DE-AS05-79ER-10399)
(DE84-005475; DOE/ER-10399/T1) Avail: NTIS HC A02/MF A01

Both mu-methylene-dimella species and heterogeneously catalyzed reactions were studied. The reaction of Fe2 CO8 (-2) with methylene iodide gives the parent bridging methylene complex octa carbonyl (mu-methylene) diiron which reacts with olefins and acetylenes in heterogeneous Fischer-Tropsch reactions. The formation of hydrocarbons was studied. Alcohols were studied as substrates for Fischer-Tropsch reactions. DOE

N84-20660# Los Alamos Scientific Lab., N. Mex.
DEVELOPMENT OF THE CARS METHOD FOR MEASUREMENT OF PRESSURE AND TEMPERATURE GRADIENTS IN CENTRIFUGES
A. H. Zeltmann and J. J. Valentini Dec. 1983 18 p refs
(Contract W-7405-eng-36)
(DE84-006321; LA-9811-MS) Avail: NTIS HC A02/MF A01

These experiments evaluated the feasibility of applying the CARS technique to the measurement of UF6 concentrations and pressure gradients in a gas centrifuge. The resultant CARS signals were properly related to system parameters as suggested by theory. The results have been used to guide design of an apparatus for making CARS measurements in a UF6 gas centrifuge. Ease of measurement is expected for pressures as low as 0.1 torr. Temperature gradients can be measured by this technique with changes in the data acquisition method. DOE

N84-20661# Institute of Gas Technology, Chicago, Ill.
ELECTROCHEMISTRY OF THE SULFIDE-POLYSULFIDE COUPLE Final Report, 1 Nov. 1982 - 30 Jun. 1983
R. J. Remick and E. H. Camara Jul. 1983 43 p refs
(Contract DE-AC03-76SF-00098)
(DE84-005881; LBL-16850) Avail: NTIS HC A03/MF A01

The redox behavior of solutions containing sodium sulfide and sodium polysulfide was investigated using a platinum wire electrode. Contrary to published literature, the equilibrium potential of the sulfide/polysulfide redox does have a pH-sensitive component. Platinum is not a good electrocatalyst for this couple, but upon anodization a layer is formed on the surface of the platinum that impacts a reasonable catalytic activity to the electrode. A mechanism is proposed based on present results and past literature that accounts for most if not all of the observed phenomenon. The mechanism predicts that electronically conducting materials that contain sulfur as part of their chemical composition, specifically CoS, NiS, CuS, PbS, and MoS2, should be excellent electrocatalysts for both anodic and cathodic reactions. This was confirmed for CoS, CuS, and PbS previously. The range of materials investigated includes NiS and MoS2 and two alternative methods for preparing sulfide electrodes were added. Experimental results indicate that MoS2 is the preferred electrocatalyst for the sulfide/polysulfide redox couple and that a relatively inexpensive composite electrode can be fabricated using 10% MoS2, 80% carbon black, and 10% Teflon 30. DOE

N84-20662# Virginia Univ., Charlottesville. Dept. of Chemistry.
GLOW DISCHARGE AS AN ATOMIZATION AND IONIZATION DEVICE Progress Report, 1 Nov. 1982 - 1 Nov. 1983
Willard W. Harrison 1984 7 p
(Contract DE-AS05-80ER-10635)
(DE84-005253; DOE/ER-10635/3) Avail: NTIS HC A02/MF A01

Whether by direct resonant ionization or laser enhanced ionization, the result is a selective mass spectrum which features only isotopes of the selected element. The glow discharge offers possibilities for both resonance ionization mass spectroscopy and laser enhanced ionization with its various internal excitation possibilities. The combination of a tunable dye laser with the glow discharge can yield an advantageous method for the direct analysis of solids by mass spectrometry. DOE

N84-20663# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
NUMERICAL SIMULATION OF FLAME PROPAGATION IN A CLOSED VESSEL
James A. Sethian Oct. 1983 11 p refs Presented at the 5th GAMM Conf. on Numerical Methods in Fluid Mech., Rome, 5-7 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004959; LBL-16828; CONF-8310225-1) Avail: NTIS HC A02/MF A01

A numerical simulation of a flame propagation in a swirling, premixed, combustible fuel inside a closed vessel is presented. This model is appropriate for viscous, turbulent combustion, and includes the effects of exothermic volume expansion along the flame front. The method, which is particularly suited for flow at high Reynolds number, uses random vortex element techniques

coupled to a flame propagation algorithm based on Huyghen's principle. The various effects of pressure, boundary conditions, exothermicity and viscosity on the speed and shape on the burning flame are analyzed. DOE

N84-20664# Westgate Research Corp., Los Angeles, Calif.
CHEMISTRY AND APPLICATION OF OZONE AND OZONE/UV LIGHT FOR WATER REUSE-2 Final Technical Report, 1 Feb. 1981 - 1 Feb. 1982
E. Leitis, J. D. Zeff, and M. M. Smith 15 Jun. 1983 189 p refs (Contract DI-14-34-0001-1436)
(PB84-140557; W84-00962; OWRT-C-00256-R(1436)(1)) Avail: NTIS HC A09/MF A01 CSCL 07D

The continuation of an experimental study to elucidate the chemistry of Ultraviolet light (UV) enhancement of ozone (O3) oxidation of refractory organics in wastewater is described. The overall purpose is to reduce the fixed and operating costs of removing these constitutents prior to water reuse: (1) an investigation of the synergistic effect of ozone and wave-length of UV light in breaking carbon-chlorine bonds, (2) evaluation of the UV-ozonation process to oxidize amino compounds, (3) survey of heavy metal ion interference in the UV ozonation system, and (4) accumulation of data from bench and pilot plant tests on industrial effluent from a chlorophenol plant in the Northwest are examined. DOE

N84-20665# Midwest Research Inst., Kansas City, Mo.
COMPREHENSIVE ASSESSMENT OF THE SPECIFIC COMPOUNDS PRESENT IN COMBUSTION PROCESSES. VOLUME 1: PILOT STUDY OF COMBUSTION EMISSIONS VARIABILITY Final Report
Clarence Haile, John S. Stanley, R. M. Lucas (Research Triangle Inst., Research Triangle, N. C.), Denise K. Melroy (Research Triangle Inst., Research Triangle, N. C.), Carter P. Nulton (Southwest Research Inst., San Antonio, Tex.), and William L. Yauger, Jr. (Gulf South Research Inst., New Orleans, La.) Jun. 1983 317 p refs
(Contract EPA-68-01-5915)
(PB84-140670; EPA-560/5-83-004-Vol-1) Avail: NTIS HC A14/MF A01 CSCL 07D

This pilot study was conducted as a prelude to a nationwide survey of organic emissions from major stationary combustion sources. The primary objectives of the pilot study were to obtain data on the variability of organic emissions from two such sources and to evaluate the sampling and analysis methods. These data are used to construct the survey design for the nationwide survey. The compounds of interest are polynuclear aromatic hydrocarbons (PAHs) and chlorinated aromatic compounds, including polychlorinated biphenyls (PCBs), polychlorinated dibenzo-p-dioxins (PCDDs), and polychlorinated di-benzofurans (PCDFs). Of particular interest is 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). GRA

N84-20530*# Tennessee Univ. Space Inst., Tullahoma. Applied Physics Research Group.
MEASUREMENT OF SPRAY COMBUSTION PROCESSES
C. E. Peters, E. F. Arman, J. O. Hornkohl, and W. M. Farmer *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 47-50 refs (For primary document see N84-20525 11-07)
(Grant NAG3-370)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20532*# Pennsylvania State Univ., University Park.
PREDICTIONS OF SPRAY COMBUSTION INTERACTIONS
J.-S. Shuen, A. S. P. Solomon, and G. M. Faeth *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 55-66 refs (For primary document see N84-20525 11-07)
(Grant NAG3-190)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20534*# Drexel Univ., Philadelphia, Pa.
COMBUSTION CHARACTERISTICS IN THE TRANSITION REGION OF LIQUID FUEL SPRAYS
Nicholas P. Cernansky, Izak Namer, Robert J. Tidona, and Hamid Sarv *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 77-80 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20535*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
TURBULENT SWIRLING COMBUSTION
Holger T. Sommer, Raymond J. Mosula, and Ellice Seiden *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 81-82 refs (For primary document see N84-20525 11-07)
(Contract NAG3-401)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20552*# Northwestern Univ., Evanston, Ill.
LEAN LIMIT PHENOMENA
C. K. Law *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 243-249 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20553*# Washington Univ., Seattle.
INTERACTIVE COMPUTER MODELING OF COMBUSTION CHEMISTRY AND COALESCENCE-DISPERSION MODELING OF TURBULENT COMBUSTION
David T. Pratt *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 251-255 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20554*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FAST ALGORITHMS FOR COMBUSTION KINETICS CALCULATIONS: A COMPARISON
Krishnan Radhakrishnan (Michigan Univ.) *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 257-267 refs (For primary document see N84-20525 11-07)
(Grants NAG3-147; NAG3-294)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20555*# Princeton Univ., N. J.
THE ROLE OF SURFACE GENERATED RADICALS IN CATALYTIC COMBUSTION
D. A. Santavicca, Y. Stein, and B. S. H. Royce *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 269-274 refs (For primary document see N84-20525 11-07)
(Grants NAG3-353; AF-AFOSR-6475)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20557*# Purdue Univ., Lafayette, Ind.
SPONTANEOUS IGNITION CHARACTERISTICS OF GASEOUS HYDROCARBON-AIR MIXTURES
G. Freeman and A. H. Lefebvre *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 285-296 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20558*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RANDOM VORTEX METHOD FOR COMBUSTING FLOWS
C. J. Marek *In its* Combust. Fundamentals Res. Apr. 1984 p 297-300 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20559*# California Univ., Berkeley.
AERODYNAMIC FEATURES OF FLAMES IN PREMIXED GASES
A. K. Oppenheim *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 301-307 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20560*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRANSIENT FLOW COMBUSTION
Robert R. Tacina *In its* Combust. Fundamentals Res. Apr. 1984 p 309-310 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-20561*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
COMBUSTOR FLAME FLASHBACK
Margaret P. Proctor (Case Western Reserve Univ.), David N. Anderson, and James S. Tien (Case Western Reserve Univ.) *In its* Combust. Fundamentals Res. Apr. 1984 p 311-312 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21B

N84-21347# Westinghouse Electric Corp., Pittsburgh, Pa. Material Science Div.
MICROSTRUCTURE-PROPERTY RELATIONSHIP FOR POROUS CaO STABILIZED ZrO2 SUPPORT TUBES
Barry R. Rossing *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 45-55 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

N84-21348# Ecole Nationale Superieure d'Electrochimie et d'Dlectrometallurgie, Cedex (France).
RESEARCH AND DEVELOPMENT ON HIGH TEMPERATURE WATER VAPOR ELECTROLYSIS
E. J. L. Schouler, J. C. Viguie (Centre d'Etudes Nucleaires de Grenoble), and L. J. Olmer (Centre d'Etudes Nucleaires de Grenoble) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 57-66 refs Sponsored in part by the Commission of the European Communities (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21349# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Dept. of New Technologies.
HIGH TEMPERATURE ELECTROLYSIS OF WATER VAPOR. STATUS AND PERSPECTIVES OF THE GERMAN RESEARCH AND DEVELOPMENT ACTIVITIES
W. Doenitz, E. Erdle, and R. Schamm *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 67-80 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21350# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
FUSION AND HIGH TEMPERATURE ELECTROLYSIS
J. A. Fillo, J. R. Powell, R. Benenati, and F. Malick (Westinghouse Electric Corp., Madison, Pa.) *In its* Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 81-88 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21351# Minnesota Univ., Minneapolis.
HIGH TEMPERATURE OXIDE ELECTROLYTES FOR THE SPLITTING OF WATER. THE ROC PROCESS
Edward A. Fletcher, Richard B. Diver, and Jon E. Noring (Sandia National Labs.) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 89-102 refs (For primary document see N84-21342 11-76)
(Contracts DE-AC02-82ER-12089; N00014-82-K-0523)
Avail: NTIS HC A16/MF A01

N84-21353# Naval Research Lab., Washington, D. C. Chemistry Div.
ELECTROCHEMICAL APPLICATIONS OF STABILIZED ZIRCONIA
Kurt H. Stern *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 127-139 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21363# Westinghouse Electric Corp., Pittsburgh, Pa.
SOME NON-ELECTROCHEMICAL REQUIREMENTS FOR AIR ELECTRODE MATERIALS OF HIGH TEMPERATURE SOLID ELECTROLYTE FUEL CELLS
R. Ruka *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 295-302 (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-10789)
Avail: NTIS HC A16/MF A01

N84-21366# Stanford Univ., Calif. Dept. of Chemical Engineering.
MECHANISMS OF CATALYTIC OXIDATION OF HYDROCARBONS IN A SOLID-ELECTROLYTE FUEL CELL
Bang C. Nguyen and David M. Mason *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 331-347 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21367# Imperial Coll. of Science and Technology, London (England). Dept. of Metallurgy and Material Science.
OXYGEN EXCHANGE MEASUREMENTS ON ZIRCONIA-YTTRIA ELECTROLYTE SURFACES MODIFIED BY VARIOUS DOPANTS
D. S. Tannhauser, J. A. Kilner, and B. C. H. Steele *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 349-360 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21369# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
RE-EXAMINATION OF BETA-ALUMINA DOPED WITH CHROMIUM USING PHOTOACOUSTIC SPECTROSCOPY
Ann M. Schuler, John H. Kennedy (California Univ., Santa Barbara), and George E. Cabaniss (North Carolina Univ., Chapel Hill) *In its* Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 1-12 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N84-20666 Michigan State Univ., East Lansing.
CORROSION IN LARGE AIRCRAFT: MANAGEMENT OF THE PROBLEM Ph.D. Thesis
Nina Samsami 1983 137 p
Avail: Univ. Microfilms Order No. DA8400624

Field-level corrosion maintenance on B-52 airplanes was compared from one airbase to another and it was found that variations can be related to environmental differences in weather and atmospheric pollutants. The extent and nature of such maintenance is similar to that of another large airplane system analyzed, the C-141A, despite significant differences in age, mission, and utilization. It can be expected that all large military airplanes will be similar, with respect to the effect of environment on maintenance. Considering the environmental variations, sound statistical principles then were applied to the problem of sampling a large airplane fleet for special in-depth discovery inspections. It is shown that a smaller sample than used currently is sufficient, and large savings are possible. Dissert. Abstr.

N84-20667 Lehigh Univ., Bethlehem, Pa.
ROLE OF MICROSTUCTURE IN HYDROGEN ASSISTED CRACKING Ph.D. Thesis
Ming Gao 1983 192 p

Avail: Univ. Microfilms Order No. DA8329467

A hydrogen partitioning model was developed to account for the role of hydrogen microstructure interaction in environmentally assisted crack growth. The model suggests that the rate for hydrogen assisted crack growth is essentially determined by two basic factors: (1) the rate of hydrogen supplied to the fracture process zone, which is controlled by one of the rate controlling processes, and (2) the partitioning of hydrogen amongst different microstructural elements or traps (principally between prior austenite grain boundaries and the matrix), which is controlled by the hydrogen trap interactions and determines the contribution by each element. Quantitative evaluation of the model in relation to crack growth response was carried out and shows very good agreement between the model predictions and experiments for AISI 4340 and 4130 steels in hydrogen and for AISI 4340 steel in hydrogen sulfide. Dissert. Abstr.

N84-20668 Northwestern Univ., Evanston, Ill.
PRE-TRANSITION PHENOMENA IN AN IRON-NICKEL ALLOY PRIOR TO THE MARTENSITE TRANSFORMATION Ph.D. Thesis
Robert John Comstock 1983 343 p
Avail: Univ. Microfilms Order No. DA8400659

The displacive nature of the martensite transformation implies that atomic vibrations may provide a key role in the nucleation event. Theories of localized soft modes suggest that strained regions in the lattice provide potential nucleation sites. The strain induced softening, resulting from anharmonic terms in the elastic energy, lowers the barrier to nucleation and permits the crystal to approach a lattice instability. The resulting instability leads to the formation of the new crystal structure. The features of this theory are consistent with the first order, heterogeneous characteristics of the martensite transformation. X-ray diffraction measurements were performed on Fe-30.5Ni single crystals to obtain information on the vibrational state of the sample prior to the martensite transformation. The measurements included integrated intensities of Bragg peaks as well as diffuse scattering along several directions in reciprocal space. Data were obtained from room temperature to within approximately 1 K of the transformation temperature. Dissert. Abstr.

N84-20669# National Mechanical Engineering Research Inst., Pretoria (South Africa). Metallurgy Div.
THE DEVELOPMENT OF WROUGHT HEAT-RESISTING ALLOYS FOR GAS TURBINES
J. E. Davies Dec. 1982 22 p refs
(CSIR-ME-1778; ISBN-0-7988-2375-5) Avail: NTIS HC A02/MF A01

The metallurgical development of wrought heat resisting alloys is presented. These alloys cover a temperature of application range from 500 to 1000 C and are discussed under the various alloy systems of iron base nickel iron chromium and nickel chromium. Cobalt base alloys and the refractory metals are mentioned. Oxide dispersion strengthened, powder metallurgical alloys and fiber reinforced materials are outlined in relation to development plans. Various processing methods are mentioned together with composition control by the electron vacancy number. S.L.

N84-20670*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
METHOD OF COATING A SUBSTRATE WITH A RAPIDLY SOLIDIFIED METAL Patent Application
Huai-Pu Chu and Charles L. Staugaitis, inventors (to NASA) Filed 19 Mar. 1984 10 p
(NASA-Case-GSC-12880-1; US-Patent-Appl-SN-590925) Avail: NTIS HC A02/MF A01 CSCL 11F

A method for coating a substrate with rapidly solidified metal is described which comprises spraying a mixture of rapidly solidified (RS) metal powder and small peening particles at high velocity against a substrate. The velocity is sufficient for the rapidly solidified metal powder and peening particles to impact the substrate and simultaneously bond the metal powder to the substrate. If the substrate is metallic, the method may provide the simultaneous mechanical working of the substrate surface. Two or more different R/S metal powders may be introduced into the peening particle stream simultaneously or alternately, or metal and nonmetal powders may be applied together in layers. NASA

N84-20671*# National Aeronautics and Space Administration, Washington, D. C.
TECHNIQUE FOR MANUFACTURING NICKEL ELECTRODES
H. Yamazaki, T. Yamane, and Y. Kumano May 1983 7 p Transl. into ENGLISH of Japanese Patent no. 56-40946 (24 Sep. 1981) p 119-121 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77239; NAS 1.15:77239) Avail: NTIS HC A02/MF A01 CSCL 11F

A method of manufacturing nickel electrodes distinctive for its use of a composite material for the electrode made up of nickel compound, electrode material, cobalt in metal form or cobalt in compound form is investigated. The composite is over-discharged (same as reverse charging) in an alkaline solution. After dealkalization, synthetic resin adhesive is added and the electrode is formed. Selection of the cobalt compound is made from a group consisting of cobalt oxide, cobalt hydroxide, cobalt carbonate and cobalt sulfate. The method upgrades plate characteristics by using an active material in a non-sintered type nickel electrode, which is activated by electro-chemical effect. M.A.C.

N84-20672*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MECHANISM OF CORROSION OF Ni BASE SUPERALLOYS BY MOLTEN Na2MoO4 AT ELEVATED TEMPERATURES
Ajaya K. Misra (NAS-NRC, Washington, D.C.) and Carl A. Stearns 1983 41 p Presented at the Fall Meeting of the Electrochem. Soc., Washington, D.C., 9-14 Oct. 1983
(NASA-TM-83580; E-1970; NAS 1.15:83580) Avail: NTIS HC A03/MF A01 CSCL 11F

The corrosion of nickel base superalloy, U-700, by molten Na2MoO4 was studied in the temperature range of 750 deg to 950 deg C. After an induction period, the rate of corrosion is linear and catastrophic corrosion is observed. It is shown that the induction period is associated with the attainment of a minimum MoO3 activity in the melt, which corresponds to the equilibrium MoO3 activity for the reaction, $2MoO3(l) + Mo = 3MoO2(s)$. A mechanism is proposed to describe the catastrophic nature of corrosion, which involves transport of $Ni++$ through the melt resulting in formulation of NiO at the melt gas interface and basic fluxing of Cr2O3. The effect of the amount of Na2MoO4 on the corrosion kinetics was also studied. It is found that evaporation and the thermodynamic calculations for the Na2MoO4 - MoO3 system the activity of MoO3 is reduced considerably when dissolved in Na2MoO4, which causes a sharp decrease in the rate of evaporation of MoO3 from a Na2MoO4 - MoO3 melt. E.A.K.

N84-20673*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MECHANICAL CONTACT INDUCED TRANSFORMATION FROM THE AMORPHOUS TO THE CRYSTALLINE STATE IN METALLIC GLASS
Kazuhisa Miyoshi and Donald H. Buckley 13 Apr. 1984 22 p refs Presented at 11th Conf. on Metallurg. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by American Vacuum Society and American Society for Metals and Indian Vacuum Society
(NASA-TM-83583; E-1947; NAS 1.15:83583) Avail: NTIS HC A02/MF A01 CSCL 11F

Friction and wear tests were conducted with 3.2- and 6.4-millimeter-diameter aluminum oxide spheres sliding, in reciprocating motion, on a Fe67Co18B14Si1 metallic foil. Crystallites with a size range of 10 to 150 nanometers were produced on the wear surface of the amorphous alloy. A strong interaction between transition metals and metalloids such as silicon and boron results in strong segregation during repeated sliding, provides preferential transition metal-metalloid clustering in the amorphous alloy, and subsequently produces the diffused honeycomb structure formed

by dark grey bands and primary crystals, that is, alpha-Fe in the matrix. Large plastic flow occurs on an amorphous alloy surface with sliding and the flow film of the alloy transfers to the aluminum oxide pin surface. Multiple slip bands due to shear deformation are observed on the side of the wear track. Two distinct types of wear debris were observed as a result of sliding: an alloy wear debris, and/or powdery-whiskery oxide debris. A.R.H.

N84-20674*# Syracuse Univ., N. Y. Dept. of Chemical Engineering and Materials Science.
LITERATURE SURVEY ON OXIDATIONS AND FATIGUE LIVES AT ELEVATED TEMPERATURES Final Report
H. W. Liu and Y. Oshida Apr. 1984 52 p refs
(Grant NAG3-348)
(NASA-CR-174639; NAS 1.26:174639) Avail: NTIS HC A04/MF A01 CSCL 11F

Nickel-base superalloys are the most complex and the most widely used for high temperature applications such as aircraft engine components. The desirable properties of nickel-base superalloys at high temperatures are tensile strength, thermomechanical fatigue resistance, low thermal expansion, as well as oxidation resistance. At elevated temperature, fatigue cracks are often initiated by grain boundary oxidation, and fatigue cracks often propagate along grain boundaries, where the oxidation rate is higher. Oxidation takes place at the interface between metal and gas. Properties of the metal substrate, the gaseous environment, as well as the oxides formed all interact to make the oxidation behavior of nickel-base superalloys extremely complicated. The important topics include general oxidation, selective oxidation, internal oxidation, grain boundary oxidation, multilayer oxide structure, accelerated oxidation under stress, stress-generation during oxidation, composition and substrate microstructural changes due to prolonged oxidation, fatigue crack initiation at oxidized grain boundaries and the oxidation accelerated fatigue crack propagation along grain boundaries. S.L.

N84-20675*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A STUDY OF THE SOLIDIFICATION PARAMETERS INFLUENCING STRUCTURES AND PROPERTIES IN MAR-M246(Hf)
M. H. Johnston and R. A. Parr Jan. 1984 29 p refs
(NASA-TM-82569; NAS 1.15:82569) Avail: NTIS HC A03/MF A01 CSCL 11F

The nickel-base superalloy MAR-246(Hf) was studied to determine the factors affecting basic morphology and fatigue properties. Of particular interest was the degradation of fatigue properties with deviation from the [001] growth orientation. Examination of directionally solidified samples showed a dependence of carbide shape and interdentritic segregation on growth rate. Heat treatment studies focused on the gamma prime structure, determining that it reaches maximum growth after twenty-four hours but its size and stability depends on the temperature of the treatment. Fatigue test specimens were oriented crystallographically in the failed and unfailed regions and found to have rotated their orientation during the testing if they were located a significant distance from [001]. This would place increased strain on the crystal and precipitate early failure. Author

N84-20676*# Pittsburgh Univ., Pa. Dept. of Metallurgical and Materials Engineering.
INVESTIGATION INTO THE ROLE OF SODIUM CHLORIDE DEPOSITED ON OXIDE AND METAL SUBSTRATES IN THE INITIATION OF HOT CORROSION Final Report, Apr. 1980 - Aug. 1983
N. Birks [1983] 108 p refs
(Grant NAG3-44)
(NASA-CR-173377; NAS 1.26:173377; FR-6) Avail: NTIS HC A06/MF A01 CSCL 11F

Sodium chloride is deposited on the surface of alumina substrates and exposed to air containing 1% SO2 at temperatures between 500 C and 700 C. In all cases the sodium chloride was converted to sodium sulfate. The volatilization of sodium chloride from the original salt particles was responsible for the development of a uniform coating of sodium sulfate on the alumina substrate. At temperatures above 625 C, a liquid NaCl-Na2SO4 autectic was formed on the substrate. The mechanisms for these reactions are given. One of the main roles of NaCl in low temperature hot corrosion lies in enabling a corrosive liquid to form. Author

N84-20677# SKF Technology Services, King of Prussia, Pa.
DEVELOPMENT OF A 3-d MICROSCALE TOPOGRAPHY SYSTEM, PHASE 1 Final Technical Report
S. S. Gassel, Bharat B. Aggarwal, and T. M. Yonushonis Dec. 1983 114 p
(Contract N00014-79-C-0792)
(AD-A137871; SKF-AT83D001) Avail: NTIS HC A06/MF A01 CSCL 11/6

This report summarizes the work done in Phase 1 of a program to develop a 3-D surface measurement system using a stereo pair of SEM images. Phase 1 consisted of a comprehensive literature survey to define the state-of-the-art in stereomicroscopy (Task 1) and a set of experiments to establish the feasibility of the proposed method (Task 2). Section 2 summarizes results from Phase 1. Section 3 describes the results of the literature survey which fulfills the objectives of Task 1. Details on the computerized literature search are provided in Appendix A. The proof-of-concept experiments are discussed in Section 4 and Appendix B. Finally, a description of the system to automate stereometry and construct a viable 3-D surface measurement tool is provided in Section 5. GRA

N84-20678# SKF Technology Services, King of Prussia, Pa.
DEVELOPMENT OF A 3-d MICROSCALE TOPOGRAPHY SYSTEM, PHASE 2 Final Technical Report
Bharat B. Aggarwal and R. F. Wehr Dec. 1983 76 p
(Contract N00014-80-C-0937)
(AD-A137872; SKF-AT83D004) Avail: NTIS HC A05/MF A01 CSCL 11/6

This report describes the technical work accomplished in the second phase of a program to develop an automated, three dimensional, quantitative surface topography measurement system using a stereo-pair of scanning electron microscope (SEM) micrographs. The system embodies the disciplines of stereomicroscopy and stereo-photogrammetry. The first phase of the program (ONR Contract N00014-79-C-0792) explored the technical feasibility of making quantitative three dimensional measurements of surface topography using a stereo-pair of SEM micrographs. The objectives of the second phase of the program (ONR Contract N00014-80-C-0937) were to develop the hardware and software necessary to implement the surface topography measurement system. GRA

N84-20679# Carnegie-Mellon Univ., Pittsburgh, Pa.
BARRIERS TO THE MIGRATION OF INTERPHASE BOUNDARIES Final Report, 3 Oct. 1979 - 8 Sep. 1983
H. I. Aaronson, W. T. Reynolds, Jr., K. Chattopadhyay, and G. J. Shiflet 6 Jan. 1984 141 p
(Contracts DAAG29-80-C-0018; DAAG29-80-K-0071)
(AD-A137902; ARO-17094.1-MS; ARO-17298.1-MS) Avail: NTIS HC A07/MF A01 CSCL 11/6

The incomplete transformation phenomenon was shown to be absent in Fe-C-Mo alloys containing 0.15 - 0.25% C and 2 1/4 - 4 1/2% Mo. Four different types of thickening kinetics of grain boundary allotriomorphs were observed in the temperature region at and just above that of the bay in the TTT-diagram. Close to the bay in the richest alloys, growth was found to cease entirely for preceptible intervals. Cessation of growth for sufficiently long times was identified as an essential element for the occurrence of incomplete transformation. Radical changes in ferrite and carbide morphology were catalogued in and below the bay region in a representative Fe-C-Mo alloy. The solute drag-like effect appears to be the primary factor responsible for incomplete transformation, for the complex growth kinetics observed in the present alloys and for the morphological effects in the bay region. Evolution of the interphase boundary structure of alpha sub 1 Cu-Zn plates was studied with high-resolution TEM. GRA

N84-20680# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
COMPARISON OF PREDICTED VERSUS EXPERIMENTALLY-DETERMINED STRESSES FOR CRACK INITIATION OF SURFACE FLAWS IN A 304 STAINLESS STEEL AND A FERRITIC STEEL
W. G. Reuter and T. A. Place Nov. 1983 12 p refs Presented at the Intern. Conf. on Fracture Prevention in Energy and Transport Systems, Rio de Janeiro, 27 Nov. 1983
(Contract DE-AC07-76ID-01570)
(DE84-005481; EGG-M-16983; CONF-8311130-2) Avail: NTIS HC A02/MF A01

The K/sub Ic/ and an empirical approach for predicting stresses for crack initiation under conditions varying from elastic to plastic were compared. Specimens containing surface flaws were examined. No correlation was found between K/sub Ic/ and empirically determined parameters. Conditions for crack initiation, however, can be predicted if a few tests are conducted on specimens containing surface flaws to develop empirical correlations. DOE

N84-20681# Rockwell International Corp., Golden, Colo. Energy Systems Group.
COMPONENT DEVELOPMENT Annual Report, Jun. 1981 - Jun. 1982
Wendell G. Brown, G. A. Riordan, ed., and I. C. Delaney, comp. 8 Nov. 1983 32 p refs
(Contract DE-AC04-76DP-03533)
(DE84-005829; RFP-3519) Avail: NTIS HC A03/MF A01

Developments of components are reported. The following topics are discussed: bakeout studies for nickel plated HP-9-4-20 high strength steel, surface cleaning and handling of OFHC copper, cleaning and compatibility of nonnuclear weapon components with various process materials, impression materials and cleaning systems, method for removing machining residues from interior confined passages, corrosion resistance study of paint coatings on uranium alloys, corrosion tests of zinc coatings on a U-0.75 Ti, ignition studies on coated and uncoated uranium alloys, stainless steel fitting failures on nitric acid lines, analysis of drybox glove failures at Rocky Flats, environmental testing of inventory bar code labels, evaluation of a styrene butadiene foam gasket as a filter/vent for the 55 gallon drum waste container, development of a carbon bonded fiber venting system for radioactive waste containers, development of a corrugated steel container for shipment and storage of TRU waste, evaluation of acid resistant HEPA filter media, characteristics of TRU waste at DOE sites, evaluation of Viton glovebox window gaskets, evaluation of flash fire protective clothing, evaluation of polymeric materials for glovebox machining operations, and investigation of the hydrogen peroxide system in Building 371. DOE

N84-20682# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
PHYSICAL METALLURGY AND ALLOY DESIGN OF DUAL PHASE STEELS
Gareth Thomas Aug. 1983 48 p refs Presented at the Distinguished Lecture Ser.. Joint Center for Mater. Sci. of N. Mex., Socorro, N. Mex., 15 Aug. 1983 -12 Jan. 1984
(Contract DE-AC03-76SF-00098)
(DE84-005182; LBL-16613) Avail: NTIS HC A03/MF A01

Dual phase steels which show great promise, but for general structural applications, are discussed. Their advantages include economy of material and enormous flexibility wherein a single alloy can be manipulated to provide a wide range of products and properties. The main limitations of low carbon dual phase steels for general applications are material dimensions, i.e., sufficient hardenability must be achieved to obtain martensite/bainite on quenching from the ((-) + (BETA)) field, and problems of microstructure control if welding must be done after the dual phase treatment. DOE

N84-20683# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Division.
EFFECT OF RHODAMINE-B ON THE ELECTRODEPOSITION OF LEAD ON COPPER
Joseph C. Farmer (Sandia Labs., Livermore, Calif.) and Rolf H. Muller Dec. 1983 46 p refs Presented at the 163rd Electrochem. Soc. Meeting, San Francisco, 8 May 1983
(Contract DE-AC03-76SF-00098)
(DE84-005535; LBL-17014; CONF-830508-28) Avail: NTIS HC A03/MF A01

Rhodamine-B chloride (10 (SIGMA)M) was used as a model substance of plating additives in a study of the electrodeposition of Pb from 1 M NaClO4, 0.5 and 5 mM Pb( ) (pH 3) on Cu. Ellipsometer measurements during cyclic voltammetry show that the addition of dye results in a more compact bulk deposit than obtained in its absence. It also prevents complete monolayer coverage during formation of the Pb underpotential deposit and shifts the bulk deposition peak to more cathodic potentials during the first potential cycle. Dye effects on potential and micromorphology disappear during subsequent cycling, but reappear after relaxation periods at open circuit. Depletion and readsorption of dye on the surface are confirmed by spectroscopic ellipsometry. Different optical film models were investigated for the interpretation of spectroscopic ellipsometer measurements by use of multidimensional analysis. DOE

N84-20684# Pacific Northwest Lab., Richland, Wash.
WIRE TENSILE TESTING FOR RADIATION HARDENING EXPERIMENTS
E. R. Bradley and R. H. Jones Nov. 1983 28 p refs Presented at the Symp. on the Use of Nonstandard Subsized Specimens for Irradiated Testing, Albuquerque, N. Mex., 23 Sep. 1983
(Contract DE-AC06-76RL-01830)
(DE84-005884; PNL-SA-11404; CONF-8309170-6) Avail: NTIS HC A03/MF A01

Nickel, niobium, vanadium, and titanium wire specimens were irradiated with T(d,n) neutrons, Be(d,n) neutrons, or 16-MeV protons to fluence levels ranging from 0.2 to 30 x 10 to the 21st power/sq m. The tensile data indicated that yield strength measurements can provide a reliable method to evaluate the hardening produced by high-energy particle irradiations. The precision of the yield strength data ranged from 0.03 to 0.18 depending on radial flux gradients, material grain size, and wire diameter. Greater variations were observed in the elongation and strain-hardening data; these variations were attributed to the tapered gage sections produced by electropolishing. Tensile elongation and work hardening were also strongly dependent on specimen diameter. DOE

N84-20685# Sandia Labs., Livermore, Calif. Materials Science Div.
BIAXIAL TENSION TESTS OF HERF 304L STAINLESS STEEL
Darcy A. Hughes Jan. 1984 24 p refs
(Contract DE-AC04-76DP-00789)
(DE84-006205; SAND-83-8239) Avail: NTIS HC A02/MF A01

High strength (100 ksi) High Energy-release Rate Forged (HERF) 304L stainless steel is being considered for future weapon components. The potential yield anisotropy of this HERF 304L stainless steel was investigated via biaxial loading experiments. Biaxial tensile tests with proportional loading were performed on thin walled turbular specimens using internal pressure and axial load. Results of these tests revealed significant yield strength anisotropy in the forgings. As a consequence, traditional isotropic yield criteria, such as the von Mises or Tresca theories, were not representative of the forged strengths. Yield strengths in a biaxial stress state with a stress ratio sigma/sub theta//sigma/sub z/ = 2 were 20% less than that calculated by the von Mises criteria and the axial yield strength. A stress ratio of sigma/sub theta//sigma/sub z/ = 2 is similar to the anticipated service induced stress state for the forged component. DOE

N84-20686# Connecticut Univ., Storrs. Dept. of Metallurgy.
ELECTRODE POLARIZATION STUDIES IN HOT CORROSION SYSTEMS Progress Report, 1 Jun. 1983 - 31 May 1984
Owen F. Devereux Jan. 1984 41 p refs
(Contract DE-AC02-76ER-02960)

(DE84-005485; DOE/ER-02960/T2) Avail: NTIS HC A03/MF A01

Anodic film formation in molten sulfides, and the deterioration of refractory oxide films in sulfide-containing molten salts were studied. Progress is reported on the following tasks: electrode polarization studies in molten Na2CO3, dissolution of refractory oxides by molten sulfides, anodic sulfide coatings, and gas/metal reactions in mixed oxidants. DOE

N84-20687# Auburn Univ., Ala. Dept. of Mechanical Engineering.

AUSTENITIZING AND MICROSTRUCTURE OF A HT-9 STEEL

Roy C. Wilcox and Bryan A. Chin 1983 22 p refs Presented at the Am. Soc. for Metals Conf. on Copper and Copper Alloys, Philadelphia, 3 Oct. 1983

(Contract DE-AS05-82NE-37900)

(DE84-004914; CONF-8310129-2) Avail: NTIS HC A02/MF A01

The effects of austenitizing temperatures and times on the microstructure of a 12Cr-1Mo-V-W steel are reported. Austenitizing temperatures covering the range of 900 to 1225(0)C and times of 30 minutes to 100 hours were used. Equilibrium microstructures were difficult to obtain because delta ferrite initially present in the steel resists dissolution during austenitizing. DOE

N84-20688# Argonne National Lab., Ill.

INTERGRANULAR CRACK PROPAGATION RATES IN SENSITIZED TYPE 304 STAINLESS STEEL IN AN OXYGENATED WATER ENVIRONMENT

J. Y. Park and W. J. Shack 1 Dec. 1983 34 p refs Sponsored by EPRI

(EPRI T117-1)

(DE84-005311; ANL-83-93) Avail: NTIS HC A03/MF A01

Intergranular stress corrosion crack (IGSCC) propagation rates were measured in three heats of sensitized Type 304 stainless steel (SS) as a function of applied load and sensitization in high purity water with 8 ppM. Crack lengths were determined by compilance measurements using in situ high temperature clip gage or LVDT methods, optical metallography on the side faces of the specimen, and fractography of the cracked surface after completion of the tests. The optical metallography measurements did not provide useful estimates of crack lengths, because large variations in IGSCC propagation across the thickness of the specimens occurred. The effects of the degree of sensitization on the IGSCC propagation rate are obscured by the data scatter. It seems clear that these variables do not lead to order of magnitude changes in the crack propagation rate. DOE

N84-20689# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.

STUDY OF THE STRUCTURE OF GRAIN BOUNDARIES IN METALS

R. W. Balluffi Jan. 1984 16 p refs

(Contract DE-AC02-78ER-05002)

(DE84-005493; DOE/ER-05002/38) Avail: NTIS HC A02/MF A01

A number of topics associated with the study of grain boundary structure in metals were examined. These include the various frameworks which were used to describe structure, a commentary on the major research methods which were employed, and some of the more important aspects of the current status of the field. DOE

N84-20690# Michigan State Univ., East Lansing. Dept. of Metallurgy.

TEM STUDIES ON THE DEFORMATION STRUCTURE OF Cu-10Ni-6Sn SPINODAL ALLOY

S. Shekhar, Tong C. Lee, and K. N. Subramanian 1983 20 p refs Presented at the TMS-AIME Fall Meeting, Philadelphia, 2 Oct. 1983

(Contract DE-AC02-81ER-10942)

(DE84-004426; CONF-8310205-4) Avail: NTIS HC A02/MF A01

Deformation structure of deformed bulk specimens, aged for various lengths of time, was investigated by transmission electron microscopy, so as to understand the mechanism of hardening in spinodally-modulated alloys. Burgers vector analysis of dislocations, that appeared to have emanated from sources active during deformation, indicated that edge and screw dislocations were mostly responsible for the deformation in homogenized specimens. On the other hand, mixed dislocations, with their Burgers vector oriented at 600 to the dislocation line, seemed to be responsible for deformation and hardening in specimens with modulated structure. DOE

N84-20691# California Univ., Livermore. Lawrence Livermore Lab.

DYNAMIC COMPRESSIVE STRAIN RATE TESTS ON 2 TYPES OF BERYLLIUM

Don Breithaupt 8 Dec. 1983 11 p refs

(Contract W-7405-eng-48)

(DE84-006126; UCID-19983) Avail: NTIS HC A02/MF A01

High strain rate (10 to the 3rd power/sec (10(3) sec(+1)) compression tests were conducted on 1162A and 1319A beryllium using the split Hopkinson bar technique. Stress strain and strain rate data were obtained on 162A beryllium to 25% strain. DOE

N84-20692# Brown Univ., Providence, R. I. Dept. of Engineering.

FATIGUE RESISTANCE AND MICROSTRUCTURE OF EXPERIMENTAL DUAL PHASE Fe/2Si/0.1C STEEL

V. B. Dutta (LBL), S. Suresh, G. Thomas (LBL), and R. O. Ritchie (LBL) Sep. 1983 16 p refs Presented at the Intern. Conf. on Fracture Prevention in Energy and Transport Systems, Rio de Janeiro, 27 Nov. - 2 Dec. 1983

(Contract DE-AC03-76SF-00098)

(DE84-004314; LBL-16681; CONF-8311130-1) Avail: NTIS HC A02/MF A01

The fatigue behavior of an experimental dual phase Fe/2Si/0. 1C steel has been examined as a function of constituent morphology with the objective of developing ferritic martensitic microstructures with optimum strength and fatigue crack propagation resistance. Microstructure containing fine globular or coarse martensite within a coarse grained ferritic matrix were found to show the highest fatigue threshold stress intensity range (DELTA)K/sub o/ values reported to date (to our knowledge) and certainly the highest combination of strength and (DELTA)K/sub o/ for steels ((DELTA)K/sub o/ values above 19 MPa(RADICAL)m with yield strengths in excess of 600 MPa). Such unusually high crack growth resistance is attributed primarily to a meandering crack path morphology which promotes slower crack extension rates from crack deflection and roughness induced crack closure mechanisms. DOE

N84-21352# Moscow Steel and Alloys Inst. (USSR).

HIGH TEMPERATURE SOLID OXIDE ELECTROLYTES FOR RESEARCH IN METALLURGICAL PROCESSES AND STEELMAKING

D. I. Ryzhonkov, S. N. Paderin, and S. I. Chemeris *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 103-125 refs (For primary document see N84-21342 11-76)

Avail: NTIS HC A16/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N84-20693 Rensselaer Polytechnic Inst., Troy, N. Y.

MODELING THE MECHANICAL BEHAVIOR OF ELASTOMERIC STYRENE-BUTADIENE-STYRENE BLOCK COPOLYMERS Ph.D. Thesis

John Kenneth Bard 1983 243 p

Avail: Univ. Microfilms Order No. DA8329612

The factors responsible for the mechanical behavior of

elastomeric styrene butadiene styrene (SBS) block copolymers are investigated by comparing the stress-strain behavior predicted by several theoretical models with experimentally observed behavior. Factors such as the filler effect of the polystyrene (PS) domains, a change in chain distribution function of the polybutadiene (PB) block due to the volume occupied by the domains, and the possible presence of trapped entanglements in the PB phase are considered. The effect of trapped entanglements is found to be of primary importance in understanding the mechanical behavior. A change in chain distribution function of the PB chains also affects the predicted stress-strain behavior, but not nearly enough to explain the deviation of the actual behavior from models which neglect trapped entanglements. Dissert. Abstr.

N84-20694# National Research Council of Canada, Ottawa (Ontario).
DEVELOPMENT OF LOW TEMPERATURE CURE EPOXY PAINT FOR OFFSHORE STEEL STRUCTURES IN COLD AREAS
O. Yoshihiro, S. Yoshiaki, and Y. Kotaro 1984 32 p refs Transl. into ENGLISH from Boshoku Gijutsu (Japan), v. 31, no. 12, 1982 p 760-768
(NRC/CNR-TT-2078; ISSN-0077-5606) Avail: NTIS HC A03/MF A01

A low temperature cure epoxy paint was developed for the purpose of protecting offshore steel structures in cold areas from corrosion. This paint is composed of epoxyacrylate resin, epoxy resin, hardener and so on, and is available as a finish coating material on an inorganic zinc-rich primer. Properties of paint and coated film, applicability with airless machine and accelerated corrosion test results are discussed. The field test and its durability results are also described. These results showed that this low temperature cure epoxy paint could be field applied and even when coated at low temperatures, had good corrosion resistance on sea area. S.L.

N84-20695*# Boeing Aerospace Co., Seattle, Wash. Engineering Technology.
CHARACTERIZATION OF PMR POLYIMIDE RESIN AND PREPREG
Paul H. Lindenmeyer and C. H. Sheppard Mar. 1984 79 p
(Contract NAS3-22523)
(NASA-CR-168217; NAS 1.26:168217; D180-26031-2) Avail: NTIS HC A05/MF A01 CSCL 11G

Procedures for the chemical characterization of PMR-15 resin solutions and graphite-reinforced prepregs were developed, and a chemical data base was established. In addition, a basic understanding of PMR-15 resin chemistry was gained; this was translated into effective processing procedures for the production of high quality graphite composites. During the program the PMR monomers and selected model compounds representative of postulated PMR-15 solution chemistry were acquired and characterized. Based on these data, a baseline PMR-15 resin was formulated and evaluated for processing characteristics and composite properties. Commercially available PMR-15 resins were then obtained and chemically characterized. Composite panels were fabricated and evaluated. Author

N84-20696*# National Aeronautics and Space Administration, Washington, D. C.
PARTICLE SIZE DISTRIBUTION OF TYPICAL CERAMIC RAW MATERIALS BY LASER GRANULOMETRY
Ilona Hrapka Wojnarovitsne and Maria Lenkel Jan. 1984 17 p refs Transl. into ENGLISH from Epitoanyag (Hungary), v. 35, no. 2, 1983 p 59-65 Transl. by Kanner (Leo) and Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77385; NAS 1.15:77385) Avail: NTIS HC A02/MF A01 CSCL 11B

The principles of the method are explained and the working of the CILAS 715 laser granulometer is described. The particle size distributions of milled glazes, quartz, feldspar and china clay were determined by this instrument and by Andreasen sedimentation. The agreement was good for isometric particles, but the china clay appears finer by sedimentation, because the platelets arrange themselves horizontally during sedimentation, while in the laser granulometer preferred orientation is prevented by circulation between the sample holder and the vibrated and stirred reservoir of the slip. Author

N84-20697*# National Aeronautics and Space Administration, Washington, D. C.
SHEARING STABILITY OF LUBRICANTS
Yohikuni Shiba and Gentetsudo Gijyutsu Mar. 1984 22 p refs Transl. into ENGLISH from Tetsudo Gijutsu Kenkyu Shiryo (Japan), v. 38, no. 3, 1981 p 99-104 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77435; NAS 1.15:77435) Avail: NTIS HC A02/MF A01 CSCL 11H

Shearing stabilities of lubricating oils containing a high mol. wt. polymer as a viscosity index improver were studied by use of ultrasound. The oils were degraded by cavitation and the degradation generally followed first order kinetics with the rate of degradation increasing with the intensity of the ultrasonic irradiation and the cumulative energy applied. The shear stability was mainly affected by the mol. wt. of the polymer additive and could be determined in a short time by mechanical shearing with ultrasound. Author

N84-20698*# National Aeronautics and Space Administration, Washington, D. C.
RECENT TRENDS AND THEORETICAL BACKGROUND IN SINTERING OF SILICON CARBIDE CERAMICS
Hiroshige Suzuki Dec. 1983 20 p refs Transl. into ENGLISH from Seramikkusu (Japan), v. 18, no. 1, 1983 p 3-9 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77378; NAS 1.15:77378) Avail: NTIS HC A02/MF A01 CSCL 11B

This article gives an outline of sintering techniques of silicon carbide and refers to recent developments. These techniques are also applicable to other oxides with a high melting point and particularly high sinterability, namely MgO and BeO. Author

N84-20699*# Boeing Aerospace Co., Seattle, Wash.
EVALUATION OF PROPELLENT TANK INSULATION CONCEPTS FOR LOW-THRUST CHEMICAL PROPULSION SYSTEMS: EXECUTIVE SUMMARY Final Report
T. Kramer, E. Brogren, and B. Siegel Mar. 1984 37 p refs
(Contract NAS3-22824)
(NASA-CR-168321; NAS 1.26:168321; BAC-D180-28274-1) Avail: NTIS HC A03/MF A01 CSCL 11G

Cryogenic propellant tank insulations or liquid oxygen/liquid hydrogen low-thrust 2224N (500 lbf) propulsion systems (LTPS) were assessed. The insulation studied consisted of combinations of N2-purged foam and multilayer insulation (MLI) as well as He-purged MLI-only. Heat leak and payload performance predictions were made for three shuttle-launched LTPS designed for shuttle bay packaged payload densities of 56 kg cu/m (3.5 lbm/cu ft), 40 kg/cu m (2.5 lbm/cu ft) and 24 kg/cu m (1.5 lbm/cu ft). Foam/MLI insulations were found to increase LTPS payload delivery capability when compared with He-purged MLI-only. An additional benefit of foam/MLI was reduced operational complexity because orbiter cargo bay N2 purge gas could be used for MLI purging. Maximum payload mass benefit occurred when an enhanced convection, rather than natural convection, heat transfer was specified for the insulation purge enclosure. The enhanced convection environment allowed minimum insulation thickness to be used for the foam/MLI interface temperature selected to correspond to the moisture dew point in the N2 purge gas. Experimental verification of foam/MLI benefits was recommended. A conservative program cost estimate for testing a MLI-foam insulated tank was 2.1 million dollars. This cost could be reduced significantly without increasing program risk. Author

N84-20700*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR IMPROVING MOISTURE RESISTANCE OF EPOXY RESINS BY ADDITION OF CHROMIUM IONS Patent Application
Anne K. St.Clair, Terry L. St.Clair, Diane M. Stoakley, and Jag J. Singh, inventors (to NASA) Filed 3 Nov. 1983 17 p
(NASA-Case-LAR-13226-1; US-Patent-Appl-SN-548583) Avail: NTIS HC A02/MF A01 CSCL 11B

A chromium ion-containing epoxy with improved resistance to moisture is produced wherein the chromium ions are believed to prevent the absorption of water molecules by themselves coordinating to the -OH groups on the epoxy chain. Three different and distinct processes for producing this result are described. The epoxy resins are based on diglycidyl ether of bisphenol A (DGEBA) and tetraglycidyl methylene dianiline (TGMDA). NASA

N84-20701*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROCESS FOR IMPROVING MOISTURE RESISTANCE OF EPOXY RESINS BY ADDITION OF COBALT IONS Patent Application
Anne K. St.Clair and Diane M. Stoakley, inventors (to NASA) Filed 3 Nov. 1983 17 p
(NASA-Case-LAR-13230-1; US-Patent-Appl-SN-548584) Avail: NTIS HC A02/MF A01 CSCL 11B

A resin product useful as an adhesive, composite or casting resin and the process for its preparation are described which result in improved flexural strength mechanical property characteristics. This improved flexural strength is attained with little or no change in density, thermal stability or moisture resistance by chemically incorporating 1.2 to 10.6% by weight Co(III) ions in an epoxidized resin system. NASA

N84-20702*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
FIRE RESISTANT POLYMERS BASED ON 1-((DIALKOXYPHOSPHONYL)METHYL)-2,4- AND -2,6-DIAMINOBENZENES Patent Application
John A. Mikroyannidis (NAS-NRC, Washington, D.C.) and Demetrius A. Kourtides, inventors (to NASA) Filed 9 Jan. 1984 13 p
(NASA-Case-ARC-11512-1; US-Patent-Appl-SN-569373) Avail: NTIS HC A02/MF A01 CSCL 11B

Diacylhalides are reacted with 1-[(dialkoxy or dihaloalkoxyphosphonyl)]methyl)-2,4- and 2,6- diamino benzenes to produce polyamides which have desirable heat and fire resistance properties. NASA

N84-20703# Wisconsin Univ., Madison. Dept. of Chemical Engineering.
PROPERTIES OF MULTIPHASE POLYURETHANE SYSTEMS Final Report, 1 Jul. 1982 - 30 Jun. 1983
Stuart L. Cooper Jul. 1983 25 p
(Contract N00019-82-C-0246)
(AD-A137542; AD-E301319) Avail: NTIS HC A02/MF A01 CSCL 11/9

The incorporation of urea linkages in the polyurethane hard segment has a profound effect on the phase separation and domain structure of polyether polyurethaneureas (PEUU's). This is due to the high polarity difference between the hard and soft segments and the likely development of a three dimensional hydrogen bonding network. A new series of PEUU's was synthesized from 4,4'-diphenyl methane diisocyanate, ethylene diamine and poly (tetramethylene oxide) (PTMO). The molar ratios of the reactants and the soft segment (PTMO) molecular weight were varied to produce samples of varying hard segment content and block length. Previously (1981-82) we reported results of thermal, dynamic, mechanical and tensile experiments on these materials. In the past year we have continued our investigation of these materials using IR spectroscopy. GRA

N84-20704# Army Materials and Mechanics Research Center, Watertown, Mass. Polymer Research Div.
PREPARATION AND PROPERTIES OF POLYURETHANE AND POLYURETHANEUREA ELASTOMERS FROM METHYLENE BIS(4-CYCLOHEXYLISOCYANATE) Final Report
Catherine A. Byrne, Emily A. McHugh, Richard W. Matton, Mark A. Cleaves, Daniel P. Mack (Shippensburg State Univ.), and Nathaniel S. Schneider Oct. 1983 15 p
(DA Proj. 1L1-62706-A-553)
(AD-A137645; AMMRC-TR-83-57) Avail: NTIS HC A02/MF A01 CSCL 11/10

Transport polyurethane elastomers have been prepared and evaluated as flexible lens materials. The main ingredients of the polymers include methylene bis(4-cyclohexylisocyanate), poly (tetramethylene oxide) polyols, and 1,4-butane-diol, with small amounts of ethylene glycol and trimethylol propane added to improve properties. The polymers exhibit very good mechanical properties for the desired use, however, the low temperature (-20 C) bend recovery needs to be improved. Additional problems include the lack of a completely suitable mold release system, in which the molds could be used repeatedly and produce consistently good optical quality samples. This difficulty arises from the exceptionally strong adherence of polyurethane elastomers to mold surfaces compared to other polymers. Excellent samples were prepared on polypropylene sheets which had been press polished, but the repeated use of this material as a mold at 100 C under pressure might not be possible. GRA

N84-20705# Rutgers - The State Univ., New Brunswick, N. J. High Pressure Materials Research Lab.
MECHANICAL AND PHYSICAL PROPERTIES OF POLY (VINYLIDENE FLUORIDE) AT HIGH PRESSURES AND TEMPERATURES Interim Technical Report
K. D. Pae, K. Vijayan, R. W. Renfree, K. T. Chung, and J. I. Scheinbeim 31 Jan. 1984 39 p Submitted for publication
(Contract N00014-75-C-0540; NR Proj. 156-564)
(AD-A137842; TR-25) Avail: NTIS HC A03/MF A01 CSCL 11/9

Stress-strain behavior in tension and compression at various pressures, Pressure-Volume-Temperature (PVT) relations, and the pressure dependency of transitional behavior, by dielectric technique, of Phase 1 and Phase 2 poly(vinylidene fluoride) (PVDF) have been determined. The results obtained are used in analyzing the complex behavior of piezoelectric and pyroelectric properties of the material at high pressures and temperatures. The Young's modulus (E) of Phase 2 PVDF Increases, at room temperature, monotonically but nonlinearly, with increasing pressure as long as the amorphous material is in the rubbery state. It then takes a step-jump at Pg (5 Kbars) and continues to increase with pressure. However, the yield strength in both tension and compression is observed to be linear functions of pressure. PVT measurements clearly show the glass transition temperature (Tg) at -50C and the crystal transition (Tc) at 22C at atmospheric pressure. The Tg of both unoriented and oriented Phase 1 PVDF increase, in most part, linearly with increasing pressure except at low pressures where the increase is parabolic. GRA

N84-20706# Aeronautical Research Labs., Melbourne (Australia).
SURFACE MODIFICATION BY PHYSICAL VAPOUR DEPOSITION
R. B. Nethercott 13 Jul. 1983 67 p
(AD-A137844; ARL/MAT-Note-133) Avail: NTIS HC A04/MF A01 CSCL 11/3

The combination of properties required from modern materials has led to the design of systems in which the bulk physical properties are obtained from the main structure and the required surface properties are provided by a surface coating. One important class of techniques for coating surfaces is Physical Vapor Deposition (P.V.D.). This class includes the processes of Evaporation, Sputtering, Ion-Plating and Ion-Implantation, by which a wide variety of materials can be applied to different substrates. A review is given of the above P.V.D. processes and the resultant coating morphologies. Areas of present and future applications are discussed for which surface governed properties such as corrosion,

wear, bearing and tool life, fatigue life and surface hardening can be beneficially modified. GRA

N84-20707# Naval Weapons Center, China Lake, Calif. Ordnance Systems Dept.
THERMALLY STABLE ELASTOMERS: A REVIEW
Robert A. Rhein Oct. 1983 38 p
(AD-A137914; AD-E900297; NWC-TP-6372) Avail: NTIS HC A03/MF A01 CSCL 11/1

A literature review of high-temperature elastomers is presented. Among the types covered are fluorocarbon elastomers, polyorganophosphazenes, organic heterocyclic elastomers, silicone elastomers, and various types of silicone block copolymers. GRA

N84-20708# Ballistic Research Labs., Aberdeen Proving Ground, Md.
DYNAMIC COMPACTION OF CERAMIC MATERIALS Memorandum Report, Oct. 1981 - Sep. 1982
Gerald L. Moss, Ralph F. Benck, Paul H. Netherwood, Jr., and John R. Stratton Dec. 1983 25 p
(DA Proj. 1L1-61101-A-91A)
(AD-A137257; AD-F300370; ARBRL-MR-03327) Avail: NTIS HC A02/MF A01 CSCL 19/1

Progress relative to the explosive compaction of hot metallic and ceramic materials is described. The compaction technique, explosive characterization and initial computations of compaction with a two dimensional Lagrangian finite-difference computer code TROTT are described. Computed results are shown to indicate how sample, container, explosive and unloading waves influence the compaction process. GRA

N84-20709# National Bureau of Standards, Washington, D.C. National Engineering Lab.
PERFORMANCE CRITERIA FOR RESTORATION COATINGS FOR PORCELAIN ENAMEL SURFACES
J. F. Seiler and P. G. Campbell Sep. 1983 35 p refs
(PB84-141787; NBSIR-83-2781) Avail: NTIS HC A03/MF A01 CSCL 11B

In June 1982, the results of a laboratory based study to develop interim performance criteria for restoration coatings for porcelain enamel surfaces were reported in NBSIR 82-2553, Development of Interim Performance Criteria for Restoration Coatings for Porcelain Enamel Surfaces. Additional studies, consisting of a one year field test of three of the five restoration coatings studied in the laboratory were performed to assess the effectiveness of the interim performance criteria. The field test included periodic evaluation of the three restoration coatings applied to a total of nine bathtubs in public housing units in Alexandria, Virginia. The results of the field test were compared to the previous laboratory results and showed that the interim performance criteria were effective in selecting durable restoration coatings. This report presents the findings of the field test and includes the final performance criteria. Author (GRA)

N84-20710# National Bureau of Standards, Washington, D.C. Fracture and Deformation Div.
TENSILE, COMPREHENSIVE AND SHARP PROPERTIES OF A 96 kg/m3 CUBIC METER POLYURETHANE FOAM AT LOW TEMPERATURES
J. M. Arvidson, R. S. Bell, L. L. Sparks, and C. Guobang Dec. 1983 31 p refs Sponsored in part by Gas Research Inst.
(PB84-143643; NBSIR-83-1696) Avail: NTIS HC A03/MF A01 CSCL 11J

Polyurethane foam, having a density of 96 kg/cu m, was tested at 295, 111, 76, and 4 K. The material properties reported are Young's modulus, proportional limit, yield strength (at 0.2% offset), tensile, shear, and compressive strengths, and elongation (elastic and plastic). The test apparatus permits tension, compression, and shear testing of materials at any temperature ranging from 295 to 1.8 K. GRA

N84-21226# Bell Telephone Labs., Inc., Norcross, Ga. Chemical Engineering Group.
EVALUATION OF ADHESIVE MATERIALS FOR BONDED SHEATH CABLE DESIGNS
A. C. Levy and B. J. Overton *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 88-93 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/1

N84-21228# Telecom Australia Research Labs., Melbourne. Polymer Section.
BEHAVIOUR OF FOUR NON-MIGRATORY ANTIOXIDANTS IN SOLID POLYETHYLENE INSULATION
H. J. Ruddell, D. J. Adams, P. Latoszynski, and Bob T. deBoer *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 104-110 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/7

N84-21230# Pennwalt Corp., King of Prussia, Pa. Flourochemicals Div.
FOAMABLE PVDF FLUOROPLASTIC FOR WIRE AND CABLE APPLICATIONS
Roger L. Pecsok and Oliver Odhner *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 119-124 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/9

N84-21254# Sumitomo Electric Industries Ltd., Yokohama (Japan).
PERFORMANCE CHARACTERISTICS OF VAD SINGLE MODE FIBERS IN MASS PRODUCTION BASIS
Hisao Sato, Hiroo Kanamori, Naoki Yoshioka, Michihisa Kyoto, Masayuki Nishimura, Shuzo Suzuki, Minoru Watanabe, Shuji Kato, and Toru Kuwahara *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 294-300 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/5

N84-21360# Pacific Northwest Lab., Richland, Wash. Materials Dept.
PREPARATION AND PROPERTIES OF ELECTRICALLY CONDUCTING CERAMICS BASED ON INDIUM OXIDE-RARE EARTH OXIDES-HAFNIUM OXIDE
D. D. Marchant and J. L. Bates *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 259-267 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21361# National Bureau of Economic Research, Inc., Washington, D. C.
MICROSTRUCTURE AND ELECTRICAL PROPERTIES OF CERIA-BASED CERAMIC ELECTROLYTES
A. L. Dragoo and C. K. Chiang *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 268-281 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21377# Chloride Silent Power Ltd., Runcorn (England).
THE PREPARATION OF SODIUM BETA-ALUMINA BY THE ISOSTATIC PRESSING AND ZONE SINTERING OF SPRAY DRIED POWDERS
Stephen R. Tan *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 107-124 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

N84-21378# Purdue Univ., Lafayette, Ind. School of Materials Engineering.
SYNTHESIS OF Co^{2+} AND Ni^{2+} STABILIZED BETA ALUMINA
S. Chen, D. R. White, H. Sato, C. J. Sandberg, and H. R. Harrison *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 125-134 refs (For primary document see N84-21368 11-76)

(Grants NSF DMR-80-20249; NSF DMR-79-11137)
Avail: NTIS HC A07/MF A01

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N84-20711# National Mechanical Engineering Research Inst., Pretoria (South Africa).
RESEARCH ON ALTERNATIVE FUELS
M. S. Hunt [1983] 8 p
(CSIR-RME-465) Avail: NTIS HC A02/MF A01

The theoretical and practical investigations concerning the most efficient use of alternative fuels were examined. The research projects were calculated into short term, medium term, and long term. The designations cover the degrees of engine modification and fuel distribution from 1990 through the turn of the century. Short term projects involve little vehicle modification and employ various mixtures of existing fuels. Medium term projects demand major engine and vehicle alterations such as dual fuel systems and hybrid design systems. Long term projects require innovative technology in the development and storage of hydrogen fuels. Electric powered vehicle technology was also examined. M.A.C.

N84-20712# Materials Research Labs., Melbourne (Australia).
INITIAL ACCELERATION FOR ELECTROMAGNETIC LAUNCHERS: A FEASIBILITY STUDY ON CHEMICAL PROPELLANTS
M. J. Chung Nov. 1983 35 p refs
(MRL-TN-478; AR-003-804) Avail: NTIS HC A03/MF A01

Stored electromagnetic energy has been used at MRL and elsewhere to accelerate projectiles to ultra-high velocities. This novel method of acceleration suffers from the disadvantage that large currents could damage the conducting rails or the projectile particularly when the latter is at rest or moving slowly. This report discusses the feasibility of using conventional gun propellants to accelerate projectiles to velocities of about 1000 m/s before the pulse of electromagnetic energy is applied. A square-bore barrel is desirable to ensure a suitable interface between the barrel using chemical propellant and the rails of the electromagnetic propulsion device. Calculations show that minute amounts of an ionizing salt may be added to the propellant to enhance the conductivity of the plasma produced between the conducting rails and behind the projectile. Author

N84-20713# Naval Weapons Center, China Lake, Calif.
PRODUCTS FROM THE DETONATION OF TRINITROTOLUENE IN AIR AND NITROGEN Progress Report, Aug. 1981 - Dec. 1982
J. H. Johnson, E. D. Erickson, S. R. Smith, and C. A. Heller Nov. 1983 42 p
(F65-559)
(AD-A137809; AD-E900298; NWC-TP-6420) Avail: NTIS HC A03/MF A01 CSCL 07/3

Samples of TNT have been detonated in an enclosed chamber in air and nitrogen atmospheres. Detonation products were sampled and analyzed. Compounds collected in a nitrogen atmosphere differed from those obtained in an air atmosphere. GRA

N84-20714# Department of Energy, Washington, D. C. Office of Operational Safety.
DOE EXPLOSIVES SAFETY MANUAL: REVISION 1
Dec. 1983 103 p refs
(DE84-004295; DOE/EV-06194/2-Rev-1) Avail: NTIS HC A06/MF A01

Explosive safety requirements applicable to operations involving the development, testing, handling and processing of explosives or assemblies containing explosives are described. The manual is divided into the following sections: introduction, operational safety, explosives and personnel limits and personnel control, training, quantity distance and level of protection criteria for explosives activities, operating procedures, formulation scaleup, and insensitive high explosives qualification. DOE

N84-20715# Southwest Research Inst., San Antonio, Tex.
HEAVY-DUTY FUEL ECONOMY PROGRAM PHASE 5: INVESTIGATION OF A HEAVY-DUTY 3-WAY CATALYST SYSTEM Final Report, Aug. 1979 - Dec. 1983
Charles M. Urban Dec. 1983 49 p refs
(Contract EPA-68-03-2220)
(PB84-135722; EPA-460/3-83-010) Avail: NTIS HC A03/MF A01 CSCL 13B

This report describes the laboratory effort toward evaluation of a three-way catalyst and feedback fuel system with a heavy-duty gasoline engine. Described are the efforts toward obtaining a suitable feedback fuel system and the very limited test results obtained using the subsequently selected throttle-body fuel injection system. Average emissions values, with the systems only partially optimized, were 0.52 HC, 7.5 CO, and 3.4 NOX in grams per kilowatt-hour (0.39, 5.6, and 2.5 g/hp-hr). Author (GRA)

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N84-20716# National Inst. for Transport and Road Research, Pretoria (South Africa).
THE BEHAVIOR OF A SLAG BASE PAVEMENT STRUCTURE AT P39/1, ERASMIA UNDER HEAVY VEHICLE SIMULATOR LOADING
E. Horak and J. H. Maree Feb. 1982 55 p refs
(RP/5/82) Avail: NTIS HC A04/MF A01

An evaluation of unbound slag as a basecourse material using the Heavy Vehicle Simulator (HVS) was undertaken. Two HVS tests were performed on site P39/1 and with these tests it is possible not only to evaluate slag as a basecourse material, but also to compare it with a good quality crushed-stone base. It was felt that these tests would give further information on the possible use of slag as a basecourse material in Category A roads. A description of the HVS tests on this slag base pavement is given. The test results were evaluated using mechanistic analysis techniques. The behavior of the pavement structure is described and analyzed, and dry conditions are compared with wet conditions. Finally, general recommendations are made on the use of high standard slag bases. M.A.C.

N84-20717# South African Inst. of Refrigeration and Air Conditioning, Pretoria.
FRIGAIR 1983. PAPERS
1983 322 p refs Conf. held in Pretoria, 8-9 Mar. 1983 Prepared in cooperation with CSIR, Pretoria
(CSIR-S-281; ISBN-0-7988-2649-5) Avail: NTIS HC A14/MF A01

Programs in refrigeration technology and air conditioning research is reported. Topics discussed included: humidity control; food preservation with gas; design and application of two stage evaporative cooling systems; scale prevention and removal of hydrodynamic fluid treatment; preparation of cooling strategies for mines; potential of the single screw compressor; controlled environmental storage; computer control for a refrigeration plant; effects of condensation on the thermal conductivity of pipe insolation; oil in refrigeration plants. For individual titles, see N84-20718 through N84-20728.

N84-20718# Munters Rotaire Ltd., Huntingdon (England).
HUMIDITY CONTROL: THE PATTERN FOR CHANGE
R. H. Cates *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 p 1-14 (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The handling of new materials and processes which can be restricted by the prevailing environmental condition when determined by climatic variations is discussed. The problems are usually related to the relationship between hygroscopic materials and the surroundin air water vapor. Dimensioning the load factors which produce unacceptable levels of air supported water vapor enables selection of plants capable of meeting any specific environmental levels under operating conditions. E.A.K.

N84-20719# L'Air Liquide, Sassenage (France). Food and Pharmaceutical Industries Dept.

FOOD PRESERVATION WITH GAS **c54**

M. Coulon *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 12 p (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

Some examples of the applications of cryogenic fluids and gases with regard to the food preservation were developed. Four main subjects are covered: (1) gas packaging of foodstuffs illustrated by meat and bread packaging; (2) cryogenic refrigeration during transportation; (3) cook-chill and cook-freezing with cryogenic fluids; and (4) immersion freezing. E.A.K.

N84-20720# South African Inst. of Refrigeration and Air Conditioning, Pretoria.

DESIGN AND APPLICATION OF TWO STAGE EVAPORATIVE COOLING SYSTEMS **c34**

D. C. Cumming (C. E. Janeke and Partners) and D. M. Hawkins (Air-Dale Engineering Co. (Pty), Ltd.) *In its* Frigair 1983: Papers 1983 14 p (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The design and application of two stage evaporative systems were examined. Component selection, computer simulation, component and system performance are discussed. Application and actual operating performance results for two installations are presented. E.A.K.

N84-20721# South African Inst. of Refrigeration and Air Conditioning, Pretoria.

SCALE PREVENTION AND REMOVAL BY HYDRODYNAMIC FLUID TREATMENT

J. H. Davies (Hydrodynamics (Pty) Limited) *In its* Frigair 1983: Papers 1983 29 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The removal and prevention of mineral scale formations by treating the associated fluid with magnetics was considered. The advantage of HFT fluid treatment (HFT) over traditional methods of scale control is discussed. The hydrodynamic units total lack of maintenance requirements or need for a power source is shown. The wastefulness of energy in systems which are mechanically descaled, the problem associated with the reliance on manual dosing, and the myth that water softening will always prevent the formation of scale are discussed. E.A.K.

N84-20722# Leeds Univ. (England). Dept. of Chemical Engineering.

THE POTENTIAL OF THE SINGLE SCREW COMPRESSOR **c37**

G. G. Haselden *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 15 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The favorable characteristics of the single screw compressor in terms of throughput, low friction and bearing loads and mechanical simplicity are outlined. Some of the constructional features of the rotors and casing are discussed. The potential for development leakage and port losses, and heat transfer and friction effects are described. It is shown that computer modelling shows which leakage effects are most significant and how these can be reduced by the presence of either oil or refrigerant liquid. E.A.K.

N84-20723# South African Inst. of Refrigeration and Air Conditioning, Pretoria.

FREE COOLING: A TOTAL HVAC DESIGN CONCEPT

C. E. Janeke (C. E. Janeke and Partners) *In its* Frigair 1983: Papers 1983 16 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The free cooling concept which relates to system of air conditioning for mild, medium altitude and/or dry, hot climatic areas, whereby chillers and refrigerated cooling may be totally eliminated was examined. Substance of system comprises: (1) precooling of structure overnight; (2) direct exhausting of heat from light fitting; and (3) an improved process of evaporative cooling. Impact is that air conditioning for small and large new buildings may be facilitated at low capital costs with substantially reduces year round energy requirements. Standby chillers may be provided for depending on area and building characteristics. E.A.K.

N84-20724# South African Inst. of Refrigeration and Air Conditioning, Pretoria.

COMPUTER CONTROL OF REFRIGERATING PLANTS

B. W. Kuttel (B. W. Kuttel and Associates, Inc.) *In its* Frigair 1983: Papers 1983 19 p (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The development of microelectrics control systems is outlined, and the range of systems currently available from simple ladder diagram programmable controllers to process control computer systems is outlined. The basic operation of the systems is discussed and the application to refrigeration plants is developed. The benefits resulting from these applications to the refrigerating plant are listed. E.A.K.

N84-20725# South African Inst. of Refrigeration and Air Conditioning, Pretoria.

ANALYSIS OF STRUCTURAL STORAGE AIR CONDITIONING SYSTEMS

J. M. S. Laubscher (Watson, Edwards, VanderSpuy and Laubscher) *In its* Frigair 1983: Papers 1983 26 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The theoretical behavior of a slab when subjected to fluids at varying temperatures under forced convection conditions was analyzed. The results are applied to the structural storage air conditioning system, and the performance compared to a variable volume system. E.A.K.

N84-20726# STAL Refrigeration, Norrkoeping (Sweden).

CAPACITY CONTROL OF SCREW COMPRESSOR UNITS **c37**

A. Lundberg *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 23 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

The capacity control of the crew compressor is described and load operational characteristics under various conditions are emphasized. Electronic equipment was specifically developed to best utilize the partial load characteristics. The characteristics of a liquid chilling system which incorporates electronic capacity control and an electronically controlled expansion valve in conjunction with a screw compressor are explained. E.A.K.

N84-20727# Lehigh Univ., Bethlehem, Pa.

LATE DEVELOPMENTS IN THE FIELD OF HEAT RECOVERY **c34**

A. I. McFarlan *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 26 p refs (For primary document see N84-20717 11-31)

Avail: NTIS HC A14/MF A01

Developments to reduce the first cost and operating expense of large building air conditioning systems, with emphasis on heat transfer are described. The 3 pipe wide range coils dissipate part of the summer cooling load directly to the outside of the building without passing thru the water chillers. Tank circuits to automatically

cycle water thru storage tanks can reduce the refrigeration load about 35% during the peak day period. Means to produce above 48.9 C hot water economically for winter heating and summer dissipation of internal heat are described. A heat balance is maintained automatically to remove only the excess winter heat beyond that which can be usefully recycled or stored. E.A.K.

N84-20728# Chamber of Mines, Johannesburg (South Africa). Environmental Engineering Lab.
INVESTIGATIONS INTO THE USE OF ICE FOR COOLING DEEP MINES c34
T. J. Sheer *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 15 p refs (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

The feasibility of using ice for cooling deep mines as an alternative to sending chilled water underground was considered. It is indicated that for sections of a mine at depths greater than 3,000 m below surface, the total present value cost of a cooling system based on the use of ice would be equal to or even less than that of a chilled water system in corporating surface refrigeration plant and energy recovery turbines. For an ice system to be a practical proposition, methods must be developed to transport such large quantities of ice to storage dams underground. E.A.K.

N84-20729*# National Aeronautics and Space Administration, Washington, D. C.
TECHNIQUE FOR REMOVING RESIN FROM A MOLDED OBJECT
I. Hemmi, T. Morishita, and T. Ono May 1983 7 p Transl. into ENGLISH of Japanese Patent no. 55-114523 (3 Sep. 1980) p 83-85 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-77240; NAS 1.15:77240) Avail: NTIS HC A02/MF A01 CSCL 13H

Resin is removed from a molded object in such a way that no cracks or expansion occurs in the casting. The resin is first mixed with a ceramics powder or metal powder. This mixture is then molded and the resin is removed by heat. The molded object is then placed into a container which is sealed and large enough to allow the gas from the resin to be controlled by heat from the resin. The gas pressure at the surface of the object is increased by the gas pressure generated from the resin and the resin removed. The increase in gas pressure from the surface of the molded object is 1.5 atm to 3 atm at 350 C to 400 C. A.R.H.

N84-20730# Brigham Young Univ., Provo, Utah. Computer Aided Manufacturing Lab.
MANUFACTURING INFORMATION SYSTEM Interim Report, 1 Jul. - 31 Oct. 1983
D. K. Allen, P. R. Smith, and M. J. Smart 22 Dec. 1983 117 p (Grant AF-AFOSR-0253-82; AF Proj. 2305)
(AD-A137891; AFOSR-84-0031TR; IR-2) Avail: NTIS HC A06/MF A01 CSCL 13/8

The size and cost of manufacturing equipment has made it extremely difficult to perform realistic modeling and simulation of the manufacturing process in university research laboratories. Likewise the size and cost factors, coupled with many uncontrolled variables of the production situation has even made it difficult to perform adequate manufacturing research in the industrial setting. Only the largest companies can afford manufacturing research laboratories; research results are often held proprietary and seldom find their way into the university classroom to aid in education and training of new manufacturing engineers. It is the purpose for this research to continue the development of miniature prototype equipment suitable for use in an integrated CAD/CAM Laboratory. The equipment being developed is capable of actually performing production operations (e.g. drilling, milling, turning, punching, etc.) on metallic and non-metallic workpieces. The integrated CAD/CAM Mini-Lab is integrating high resolution, computer graphics, parametric design, parametric N/C parts programmings, CNC machine control, automated storage and retrieval, with robotics materials handling. The availability of miniature CAD/CAM laboratory equipment will provide the basis for intensive laboratory research on manufacturing information systems. GRA

N84-20731# SRI International Corp., Menlo Park, Calif. Robotics Dept.
THREE-DIMENSIONAL LOCATING OF INDUSTRIAL PARTS Final Report, Mar. 1980 - Nov. 1983
Robert C. Bolles Nov. 1983 24 p refs
(Grant NSF DAR-79-22248)
(PB84-134790; NSF/MEA-83014) Avail: NTIS HC A02/MF A01 CSCL 13I

Results are presented of research undertaken to investigate ways of using three dimensional models of industrial parts to recognize and locate those parts quickly and reliably in a combination of range and intensity data. An object modeling system based on planes and cylinders was implemented. The system groups features of the objects according to their inherent properties and according to the relationships between them. The appearance of cylindrical features was characterized from two perspectives: the intersection of a set of light planes and a cylinder, and the types of edges that are associated with cylindrical features. Based on these properties, techniques for locating cylinders in range data were developed. The concept was tested by implementing a simple range sensor and two programs to find objects with prominent cylindrical parts. GRA

N84-21224# AMP, Inc., Harrisburg, Pa.
LEAD MAKING FOR IMPROVED CONTINUOUS-FLOW MANUFACTURING SYSTEMS
Paul Heintzman *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 76-82 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/8

N84-21241# Minnesota Mining and Mfg. Co., St. Paul. TelComm Products Lab.
VERSATILE FIRE BARRIER SYSTEMS FOR TELEPHONE CABLE
Roger H. Keith, Douglas G. Dahms, and Richard R. Licht *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 206-214 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

N84-21261# Naval Ship Research and Development Center, Bethesda, Md.
CABLE FIRE STUDIES USING THE OHIO STATE UNIVERSITY RELEASE RATE APPARATUS
Walter Pocock and John Geremia (U.S. Naval Academy) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 354-371 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 12/1

N84-21262# Bell Telephone Labs., Inc., Norcross, Ga. Lightguide Applications and Systems Group.
CIRCUIT TRANSMISSION INTEGRITY OF PLENUM CABLES IN A DEVELOPING FIRE SCENARIO
C. John Arroyo and Talmage P. Bursh *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 372-380 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

N84-21263# Nippon Telegraph and Telephone Public Corp., Tokyo (Japan). Engineering Bureau.
LARGE SCALE FIRE TEST OF CABLE INSTALLED IN TUNNELS
Hiroshi Ishihara, Mitsuhiko Miwa, Kouichi Kuratani, and Jun Sawada *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 381-389 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

N84-21264# Benjamin/Clarke Associates, Inc., Kensington, Md.
OVERALL FIRE SAFER
Frederic B. Clarke, III, Irwin A. Benjamin, and Philip J. DiNenno *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 390-398 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N84-20732# British Broadcasting Corp., Kingswood (England). Engineering Div.
A RANGE OF COMBINED ERROR CORRECTION AND RECORDING CHANNEL CODE SCHEMES
M. A. Parker Nov. 1983 11 p refs
(BBC-RD-1983/16) Avail: BBC, Kingswood Warren, Tadsworth, Surrey, England

An error correction scheme which uses the inherent error detection capability of a channel code as one dimension of the correction process is described. The total overheads in terms of hardware and data rate required for correction are reduced, allowing the advantages of a channel code whilst minimizing the overheads. Author

N84-20733# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
LOW NOISE MICROWAVE FREQUENCY SYNTHESIZERS [SINTETIZADORES DE FREQUENCIAS DE MICROONDAS DE BAIXO RUIDO DE FASE]
Mario deSouza Barretti and Paulo Adabo Jul. 1983 26 p refs Presented at the 35th Ann. Reunion of the SBPC, Belem, Brazil, 6-13 Jul. 1983
(INPE-2796-PRE/358) Avail: NTIS HC A03/MF A01

Satellite communication systems generally require the use of a low noise microwave synthesizer with high frequency stability and low spurious level. The design and construction of a synthesizer over the range 4745 MHz to 5380 MHz, with steps of five MHz was described. The signal is synthesized from a cavity voltage controlled oscillator (VCO) tunable over the range 1186.25 MHz to 1345 MHz. Both the voltage controlled crystal oscillator (VCXO) and the cavity VCO are phase-locked with the same reference signal. The two signals are mixed to allow the division in the VHF band, that is simpler. Finally the cavity VCO output is multiplied by four, generating the frequency band specified above. M.A.C.

N84-20734# Radio Technical Commission for Aeronautics, Washington, D. C.
MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR AIRBORNE RADIO COMMUNICATIONS EQUIPMENT OPERATING WITHIN THE RADIO FREQUENCY RANGE 117.975 - 137.000 MGz
20 Jan. 1984 82 p refs Supersedes RTCA/DO-139 and RTCA/DO-156 and RTCA/DO-157
(RTCA/DO-186; RTCA/DO-139; RTCA/DO-156; RTCA/DO-157) Avail: NTIS HC A05/MF A01

These standards specify system characteristics that should be useful to designers, manufacturers, installers and users of airborne radio communication equipment. Compliance with these standards is recommended as one means of assuring that the equipment will perform its intended function(s) satisfactorily under all conditions normally encountered in routine aeronautical operations. The standards specify the required performance under standard and environmental conditions. Also included are recommended bench test procedures necessary to demonstrate equipment compliance with the stated minimum requirements. Tests for the installed equipment are included when performance cannot be adequately determined through bench testing. The operational characteristics for equipment installations are described and conditions that will assure the equipment user that operations can be conducted safety and reliably in the expected operational environment are defined. This document considers an equipment configuration consisting of a receiver, transmitter, control box, power supply and an antenna. Additional functions and components that refer to expanded equipment capabilities are identified as optional features. Author

N84-20735*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYSIS OF RECTANGULAR MICROSTRIP ANTENNAS
M. C. Bailey and M. D. Deshpande (George Washington Univ.) Mar. 1984 61 p refs
(NASA-TP-2276; L-15698; NAS 1.60:2276) Avail: NTIS HC A04/MF A01 CSCL 17B

The problem of microstrip antennas covered by a dielectric substrate is formulated in terms of coupled integro-differential equations with the current distribution on the conducting patch as an unknown quantity. The Galerkin method is used to solve for the unknown patch current. Using the present formulation, the radiation pattern, the resonant frequency, and the bandwidth of a rectangular microstrip antenna are computed. Design data for a rectangular microstrip antenna are also presented. Author

N84-20736# Lincoln Lab., Mass. Inst. of Tech., Lexington.
FUNDAMENTALS OF MODE S PARITY CODING
Jeffrey L. Gertz 2 Apr. 1984 41 p refs
(Contracts DOT-FA72WAI-267; F19628-80-C-0002)
(DOT/FAA/PM-83/6; ATC-117) Avail: NTIS HC A03/MF A01

The details and basic theory of the coding scheme employed on Mode S uplink and downlink transmissions are presented. Since ATCRBS interference is the main source of error for these signals, a cyclic burst detection code was chosen for Mode S. This code permits simple error detection at the transponder and more complex error correction at the sensor. The theory behind cyclic encoding and decoding as used for Mode S is presented first. Then, since polynomial multiplication and division are required for these processes, circuits for these operations are described. Finally, the last chapter describes the actual implementations specified for encoding and decoding in both the transponder and sensor.
Author

N84-20737*# Honeywell, Inc., Bloomington, Minn. Physical Sciences Center.
THE 30-GHz MONOLITHIC RECEIVE MODULE Annual Report, 3 Nov. 1982 - 31 Oct. 1983
V. Sokolov, J. Geddes, and P. Bauhahn Dec. 1983 93 p refs
(Contract NAS3-23356)
(NASA-CR-168326; NAS 1.26:168326; AR-1) Avail: NTIS HC A05/MF A01 CSCL 17B

Key requirements for a 30 GHz GaAs monolithic receive module for spaceborne communication antenna feed array applications include an overall receive module noise figure of 5 dB, a 30 dB RF to IF gain with six levels of intermediate gain control, a five-bit phase shifter, and a maximum power consumption of 250 mW. The RF designs for each of the four submodules (low noise amplifier, some gain control, phase shifter, and RF to IF submodule) are presented. Except for the phase shifter, high frequency, low noise FETs with sub-half micron gate lengths are employed in the submodules. For the gain control, a two stage dual gate FET amplifier is used. The phase shifter is of the passive switched line type and consists of 5-bits. It uses relatively large gate width FETs (with zero drain to source bias) as the switching elements. A 20 GHz local oscillator buffer amplifier, a FET compatible balanced mixer, and a 5-8 GHz IF amplifier constitute the RF/IF sub-module. Phase shifter fabrication using ion implantation and a self-aligned gate technique is described. Preliminary RF results obtained on such phase shifters are included. A.R.H.

N84-20738# Naval Ocean Systems Center, San Diego, Calif.
EQUATORIAL SCINTILLATION OF SATELLITE SIGNALS AND SOME DRIFT CHARACTERISTICS OF THE SCINTILLATION Final Report, Oct. 1981 - Aug. 1983
M. R. Paulson 15 Oct. 1983 179 p
(F59-551)
(AD-A137555; NOSC/TR-911) Avail: NTIS HC A09/MF A01 CSCL 20/14

VHF/UHF satellite signals from the Pacific FLEETSAT have been monitored in Guam from April 1982 through 1 May 1983 to study the drift characteristics of equatorial scintillation. Two receivers spaced 1500 feet (457 meters) apart in an east-west direction were used. In addition, one receiver was used to monitor the L-band signals from the Pacific MARISAT. Occurrence and intensity of equatorial scintillation are compared to drift velocities and geomagnetic and solar activity. Drift velocities and geomagnetic activity are also compared. GRA

N84-20739# Naval Research Lab., Washington, D. C. Ionospheric Effects Branch.
REAL-TIME UPDATE OF 2 H. F. (HIGH FREQUENCY) CHANNEL EVALUATION MODELS BY OBLIQUE SOUNDING Final Report
D. R. Uffelman (Stanford Research Inst., Arlington, Va.) and P. A. Hoover 13 Jan. 1984 25 p
(AD-A137556; NRL-MR-5246) Avail: NTIS HC A02/MF A01 CSCL 20/14

The Naval Research Laboratory (NRL) has been examining techniques by which the HF propagation channel may be more accurately characterized by providing a real-time update capability to existing models of the channel. Several update sources are envisioned including data from vertical incidence sounders, topside sounders, and oblique sounders. This paper discusses new results obtained by updating two currently available models with oblique sounder data. The oblique sounders used are associated with the BR Communications, Inc. AN/TRQ-35 tactical frequency management system (TFMS) currently in use by the Department of Defense. The approach is to obtain maximum observed frequency (MOF) information from an oblique sounder for a specific reference path. This information is used to obtain an update by forcing the model to fit the measurement over the reference path. As a measure of effectiveness, the updated model is then used to compute MOF's for experimental paths where MOF data are available coincident in time. In tactical scenarios, these would be unknown paths over which information is desired. Initial work indicates that providing a real-time update to a model from an oblique sounder may significantly improve the performance of the model over the reference as well as the experimental (unknown) paths. GRA

N84-20740# Stanford Univ., Calif. Information Systems Lab.
FAST ALGORITHMS FOR IMPROVED SPEECH CODING AND RECOGNITION Final Technical Report, 1 Aug. 1982 - 31 Dec. 1983
John M. Turner, M. Morf, W. Stirling, J. Shynk, and S. S. Huang 31 Dec. 1983 100 p
(Contract N00014-82-K-0492)
(AD-A137569; ISL-M736-3) Avail: NTIS HC A05/MF A01 CSCL 12/1

This research effort has studied estimation techniques for processes that contain Gaussian noise and jump components, and classification methods for transitional signals by using recursive estimation with vector quantization. The major accomplishments presented are an algorithm for joint estimation of excitation and vocal tract response, a pitch pulse location method using recursive least squares estimation, and a stop consonant recognition method using recursive estimation and vector quantization. GRA

N84-20741# Naval Research Lab., Washington, D. C. Target Characteristics Branch.
UHF (ULTRA-HIGH FREQUENCY) PROPAGATION MEASUREMENTS Final Report
F. D. Queen, P. A. Minthron, A. E. March, and D. C. Hut 31 Jan. 1984 17 p
(SF12-131-691)
(AD-A137637; NRL-MR-5271) Avail: NTIS HC A02/MF A01 CSCL 20/14

A system operating a 425 MHz was developed to measure propagation effects over an ocean path. The transmitter was installed on a boat and receiving antennas at heights of 6.4, 16.8, and 32 meters on a tower on Wallops Island. Data were taken during March 1983. The results are compared to theoretical curves of propagation loss generated from algorithms derived by Blake and Meeks. The experimental data falls between the two curves for 16.8 and 32 meters and follows Meeks' curve at the 6.4 meter height. Author (GRA)

N84-20742# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
SPEECH RECOGNITION: ACOUSTIC PHONETIC AND LEXICAL KNOWLEDGE REPRESENTATION Status Report, 1 Jul. - 31 Dec. 1983
Victor W. Zue 1 Feb. 1984 79 p
(Contract N00014-82-K-0727)
(AD-A137697) Avail: NTIS HC A05/MF A01 CSCL 05/7

The purpose of this program is to develop a speech data base facility under which the acoustic characteristics of speech sounds in various contexts can be studied conveniently; investigate the phonological properties of a large lexicon of, say 10,000 words and determine to what extent the phonotactic constraints can be utilized in speech recognition; study the acoustic cues that are used to mark work boundaries; develop a test bed in the form of a large-vocabulary, IWR system to study the interactions of acoustic, phonetic and lexical knowledge; and develop a limited continuous speech recognition system with the goal of recognizing any English word from its spelling in order to assess the interactions of higher-level knowledge sources. GRA

N84-20743# Rome Air Development Center, Griffiss AFB, N.Y.
CORRECTING FEED DISPLACEMENTS IN A SPACE FED LENS ANTENNA
R. L. Haupt Sep. 1983 60 p
(AF Proj. 4600)
(AD-A137702; RADC-TR-83-211) Avail: NTIS HC A04/MF A01 CSCL 09/5

Feed deformations in a space fed lens may seriously degrade the antenna's far field pattern. The errors in the far field pattern due to the deformations may be reduced by appropriately adjusting the phase shifters in the feed and/or lens. A linear model was used to determine and correct for feed tilt, fold, lateral far field pattern distortions due to displacement, perpendicular displacement, and any combination of these errors. Lens corrections align the main beam on boresite, while feed corrections restore gain and sidelobe levels. Combining the feed and lens corrections almost totally restores the original far field pattern. Author (GRA)

N84-20744# Environmental Research Inst. of Michigan, Ann Arbor. Radar Div.
STUDY ON EXTREMIZING ADAPTIVE SYSTEMS AND APPLICATIONS TO SYNTHETIC APERTURE RADARS Annual Technical Report, 10 Sep. 1982 - 9 Sep. 1983
Demetrior T. Politis and William H. Licata Oct. 1983 77 p
(Contract F49620-82-C-0097; AF Proj. 2312)
(AD-A137725; ERIM-163800-2-T; AFOSR-84-0024TR) Avail: NTIS HC A05/MF A01 CSCL 17/9

For this study the application of Artificial Intelligence methods in synthetic aperture radars (SAR) is investigated. It was found that the neuron-like ASE-ACE adaptive algorithm developed by Bartis, operating in the extremizing mode suggested by Klopf, can be used in a wide class of engineering problems requiring that some performance function be minimized. One such suggested application is to correct for quadratic phase errors in SAR signal processing. Author (GRA)

N84-20745# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE LORENTZ TRANSFORMATION AND THE RADAR DOPPLER EQUATION

E. M. Gaposchkin 15 Dec. 1983 37 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A137901; TR-664; ESD-TR-83-227) Avail: NTIS HC A03/MF A01 CSCL 17/9

The propagation of the electromagnetic waves in vacuum is discussed in terms of the Lorentz Transformation. A simple, but rigorous, derivation of the Lorentz Transformation is given. Then, the observed Doppler shift, seen by a moving observer, of a moving target is derived in terms of inertial position and velocity. This radar Doppler equation, given without approximation, is suitable for analysis of Doppler data for satellite orbit determination.
Author (GRA)

N84-20746# Lincoln Lab., Mass. Inst. of Tech., Lexington.
ON THE ESTIMATION OF SPECTRAL PARAMETERS USING BURST WAVEFORMS
L. M. Novak 14 Dec. 1983 65 p
(Contract F19628-80-C-0002)
(AD-A137932; TR-672; ESD-TR-83-071) Avail: NTIS HC A04/MF A01 CSCL 17/9

This report addresses the problem of estimating the spectral parameters of an observed Doppler velocity spectrum using a burst radar waveform of arbitrary length. Maximum likelihood theory is applied and the exact M.L.E. algorithm for estimating the spectral mean is derived. This M.L.E. algorithm is shown to include, as a special case, the spectral mean estimator originally proposed by R. W. Miller for processing of burst waveforms. Also, when the burst waveform is a simple pulse pair, the M.L.E. algorithm reduces to the spectral mean estimator originally proposed by W.D. Rummler. The Cramer-Rao bound for estimating the spectral mean using burst waveforms is also derived. Simplifications to the exact maximum-likelihood algorithm are proposed and the performance of various estimators is compared to the Cramer-RAo lower bound. Some preliminary results of studies of spectral width estimators are also presented. Author (GRA)

N84-20747# California Univ., Los Angeles. Dept. of Computer Science.
ADVANCED TELEPROCESSING SYSTEMS Semiannual Technical Report, 1 Apr. - 30 Sep. 1983
Leonard Kleinrock and Mario Gerla 30 Sep. 1983 236 p
(Contract MDA903-82-C-0064; DARPA Order 2496)
(AD-A137944) Avail: NTIS HC A11/MF A01 CSCL 17/2

This Semi-Annual Technical Report covers research carried out by the Advanced Teleprocessing Systems Group at UCLA under DARPA Contract No. MDA 903-82-C-0064 covering the period from April 1, 1983 to September 30, 1983. This contract has three primary designated research areas: packet radio systems, resource sharing and allocation, and distributed processing and control. This report contains the abstracts of the publications which summarize our research results in those areas during this semi-annual period, followed by the main body of the report which consists of the Ph.D. dissertation by H. Richard Gail, 'On the Optimization of Computer Network Power', conducted under the supervision of Professor Leonard Kleinrock (Principal Investigator for this contract). It addresses the tradeoff between throughput and delay involving the selection of a suitable operating point for a computer network. This tradeoff is studied through the maximization of various throughput-delay performance measures, all known as power. The models analyzed for the most part are those for a terrestrial wire network. GRA

N84-20748# SRI International Corp., Menlo Park, Calif.
CHATANIKA RADAR AND S3-2 MEASUREMENTS OF AURORAL-ZONE ELECTRODYNAMICS IN THE MIDNIGHT SECTOR Scientific Report, 6 Jul. 1982 - 31 Oct. 1983
Robert M. Robinson Nov. 1983 41 p
(Contract F19628-82-K-0045; AF Proj. 2311)
(AD-A137947; SCIENTIFIC-1; AFGL-TR-83-0221) Avail: NTIS HC A03/MF A01 CSCL 20/14

Chatanika radar measurements were combined with S3-2 satellite data obtained during passes over the midnight sector auroral zone to study the relationships between conductivities, electric fields, and currents in the Harang discontinuity. Three passes were chosen based on the quality of the radar and satellite data and the availability of supplementary ground-based or satellite measurements. The radar measured electric fields and conductivities as a function of latitude and local time. The satellite measured the latitudinal distribution of electric field and field-aligned current during the three polar passes. The most intenser electric fields were observed in the poleward and equatorward portions of the auroral oval as defined by the region of enhanced ionospheric conductivity. These high electric fields were located at the boundaries between oppositely directed field-aligned-current sheets. The dominant field-aligned-current region in the Harang discontinuity was a broad upward current sheet within which bright auroral arcs were observed. In the three cases examined, there was a net upward current in the discontinuity. Author (GRA)

N84-20749# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
FIBER-OPTIC COMMUNICATIONS SYSTEMS
Milorad Cvijetic and Nikola Savic 15 Dec. 1983 38 p Transl. into ENGLISH from Vojnotehnicki Glasnik (Yugoslavia), v. 30, No. 2, Mar. - Apr. 1982 p 172-185
(AD-A137138; FTD-ID(RS)T-1472-83) Avail: NTIS HC A03/MF A01 CSCL 17/2

Basic characteristics of fiber optic data transmission systems are discussed. It is noted that these systems have properties in common with conventional metal cable data transmission systems, but are differential by a particular approach to their estimation and practical realization. This is due to the existence of an optical level in which the signal used is found at a determined moment.
Author

N84-20750# BDM Corp., Albuquerque, N. Mex.
GENERAL ELECTROMAGNETIC MODEL FOR THE ANALYSIS OF COMPLEX SYSTEMS (GEMACS) COMPUTER CODE DOCUMENTATION (VERSION 3), VOLUME 3, PART 2 Final Technical Report, Feb. 1981 - Jul. 1983
D. L. Kadlec and E. L. Coffey Griffiss AFB, N.Y. RADC Sep. 1983 414 p
(Contract F30602-81-C-0084; AF Proj. 2338)
(AD-A137464; BDM/A-83-020-TR-Vol-3-Pt-2;
RADC-TR-83-217-Vol-3-Pt-2) Avail: NTIS HC A18/MF A01 CSCL 20/14

GEMACS solves electromagnetic radiation and scattering problems. The Method of Moments (MOM) and Geometrical Theory of Diffraction (GTD) are used. MOM is formalized with the Electric Field Integral Equation (EFIE) for wires and the Magnetic Field Integral Equation (MFIE) for patches. The code employs both full matrix decomposition and Banded Matrix Iteration (BMI) solution techniques. The MOM, GTD and hybrid MOM/GTD techniques in the code are used to solve electrically small object problems, electrically large object problems and combination sized object problems. Author

N84-20751# California Univ., Livermore. Lawrence Livermore Lab.
DISCUSSION OF MOMENT METHOD CODES WITH EMPHASIS ON APERTURE COUPLING
J. B. Grant Nov. 1983 16 p refs
(Contract W-7405-eng-48)
(DE84-005116; UCID-19932) Avail: NTIS HC A02/MF A01

Four numerical codes treating coupling through apertures to wires or other objects are discussed. The codes are time harmonic codes utilizing either an electric field integral equation or a reaction integral equation formulation. The four codes examined are: (1) a triangular patch moment method code; (2) a rectangular patch code; (3) a body of revolution moment method code; and (4) a hybrid code which uses both a moment method technique and a finite difference technique. Each code is examined with respect to the geometry of the scatterers for which it can be used. DOE

N84-20752# California Univ., Livermore. Lawrence Livermore Lab.

PHYSICAL MODELING OF EM PROPAGATION OVER NONHOMOGENEOUS TERRAIN
R. J. King Jul. 1983 20 p refs Presented at the NATO-AGARD Lecture Ser. No. 131, Turkey, Greece, and in Belgium, 18-27 Oct. 1983 Sponsored in part by NSF, Wisconsin Univ., and NATO
(Contract W-7405-eng-48)
(DE84-000178; UCRL-89507; CONF-8310167-2) Avail: NTIS HC A02/MF A01

The design of several mathematical groundwave propagation models in the frequency range of 4 to 5 GHz are discussed, and the experimental results compared with the corresponding theory. Specific examples are propagation over planar and curved surfaces, mixed paths, uniaxially anisotropic media, and media with an index of refraction near unity such as heavy vegetation. When using such models, instrumentation systems and field probing techniques are key factors in their success. DOE

N84-20753# Sandia Labs., Albuquerque, N. Mex.
DETECTION OF MULTIPLE SINUSOIDS USING AN ADAPTIVE CASCADED STRUCTURE
N. Ahmed (New Mexico Univ.), D. Hush (New Mexico Univ.), G. R. Elliott, and R. J. Fogler 1984 5 p refs Presented at the Intern. Conf. on Acoustics, Speech and Signal Process., San Diego, Calif., 19 Mar. 1984
(Contract DE-AC04-76DP-00789)
(DE84-005521; SAND-83-2665C; CONF-840371-1) Avail: NTIS HC A02/MF A01

A simple adaptive algorithm for detecting and tracking a sinusoid in broadband noise, while at the same time improving its signal to noise ratio is presented. DOE

N84-20754# Institute for Telecommunication Sciences, Boulder, Colo.
ATMOSPHERIC MILLIMETER WAVE PROPAGATION MODEL
H. J. Liebe Dec. 1983 119 p refs
(PB84-143494; NTIA/R-83-137) Avail: NTIS HC A06/MF A01 CSCL 20N

The neutral atmosphere is characterized for the frequency range from 1 to 300 GHz as nonturbulent propagation medium. Attenuation and propagation delay effects are predicated from meteorological data sets: pressure, temperature, humidity, suspended particle concentration, and rain rate. The physical data base of the propagation model consists of four terms: (1) resonance information for 30 water vapor and 48 oxygen absorption lines in the form of intensity coefficients and center frequency for each line; (2) a composite (oxygen, water vapor, and nitrogen) continum spectrum; (3) a hydrosol attenuation term for haze, fog, and cloud conditions; and (4) a rain attenuation model. Oxygen lines extend into the mesosphere, where they behave in a complicated manner due to the Zeeman effect. Author (GRA)

N84-20755# National Telecommunications and Information Administration, Boulder, Colo. Inst. for Telecommunication Sciences.
COMPUTATION OF LINEAR COMMUNICATION ANTENNAS
J. L. Lloyd Oct. 1983 183 p refs
(PB84-143502; NTIA/R-83-136) Avail: NTIS HC A09/MF A01 CSCL 17B

A consolidation of practical engineering equations for linear communication antennas suitable for use in the prediction and analysis of the system performance of high frequency communication equipment is reported. The theoretical background and the nature of the approximations are discussed. Complete equations are provided. Examples of the computations are given for each type of antenna. GRA

N84-20756# Technical Cooperation Program, Redstone Arsenal, Ala. Technical Panel KTP-3.
RADAR SIGNAL PROCESSING ARCHITECTURES AND ALGORITHMS IN DIGITAL VLSI (VERY LARGE SCALE INTEGRATION)
J. B. G. Roberts, B. J. Darby, R. W. Herring, J. G. McWhirter, and H. J. Whitehouse Aug. 1983 32 p refs
(PB84-140110; TTCP/KTP3-83/1; TR-5) Avail: NTIS HC A03/MF A01 CSCL 17I

The revolution recently wrought in signal processing by the Fast Fourier Transform (FFT) algorithm and the technology of digital integrated circuits is realized as merely the harbinger of an even more profound change involving not only a new generation of very large scale integration (VLSI) technology and algorithms properly optimized in the numerical analysis sense but also computers organized in new ways to distribute the processing load among many active elements operating concurrently. This realization stimulated a study to evaluate the likely impact of these developments, point out priorities and to make recommendations as to the research areas on which to concentrate resources. The modern signal processing techniques which are likely to provide adaptive processing, optimum estimators in angle of arrival and frequency and other functions are documented. Numerical techniques are applied for least squares minimizations, singular value decomposition, eigenvector decomposition. GRA

N84-21216# Bell Telephone Labs., Inc., Norcross, Ga.
UNBALANCED DIGITAL CROSSWALK IN BALANCED, TWISTED PAIR, INSIDE WIRING CABLE
Dan P. Woodard, Jr. *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 24-29 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 12/1

N84-21221# Tokyo Electric Power Co., Inc. (Japan). Engineering Development Div.
FIELD TRIAL OF COMPOSITE FIBER-OPTIC OVERHEAD GROUND WIRE
Simao Kubota, Hiroyoshi Kawahira, Tatsuo Nakajima, Ichiro Matsubara (Sumitomo Electric Ind., Ltd.), Yasunori Saito (Sumitomo Electric Ind., Ltd.), and Yoshinobu Kitayama (Sumitomo Electric Ind., Ltd.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 54-62 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 17/2

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics.*

N84-20757 Stanford Univ., Calif.
ULTRASONIC TRANSDUCER ARRAYS FOR NONDESTRUCTIVE TESTING Ph.D. Thesis
Richard Lawrence Baer 1983 214 p
Avail: Univ. Microfilms Order No. DA8329686

Acoustic images are used in nondestructive testing to locate and characterize mechanical defects. Imaging systems were used with arrays of transducers to form images in real time. The capabilities of these systems ultimately depend on array performance. The theory, and procedures for design and fabrication, of transducer arrays are described. Methods for coupling sound between array and specimen were analyzed. Fluids were shown to be effective couplants of sound at certain angles of incidence. Transducer arrays incorporating 45 deg shear vertical incidence were fabricated, producing excellent images. Viscous fluid couplants also were investigated. The behavior of a single narrow shear wave transducer mounted on a large substrate was studied. Effective substrate impedance was demonstrated to be a function of transducer width. A low frequency resonance is associated with this variation. Dissert. Abstr.

N84-20758*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

TOPICS IN THE OPTIMIZATION OF MILLIMETER-WAVE MIXERS

Peter H. Siegel, Anthony R. Kerr, and Wei Hwang Mar. 1984 523 p refs

(NASA-TP-2287; NAS 1.60:2287) Avail: NTIS HC A22/MF A01 CSCL 09C

A user oriented computer program for the analysis of single-ended Schottky diode mixers is described. The program is used to compute the performance of a 140 to 220 GHz mixer and excellent agreement with measurements at 150 and 180 GHz is obtained. A sensitivity analysis indicates the importance of various diode and mount characteristics on the mixer performance. A computer program for the analysis of varactor diode multipliers is described. The diode operates in either the reverse biased varactor mode or with substantial forward current flow where the conversion mechanism is predominantly resistive. A description and analysis of a new H-plane rectangular waveguide transformer is reported. The transformer is made quickly and easily in split-block waveguide using a standard slitting saw. It is particularly suited for use in the millimeter-wave band, replacing conventional electroformed stepped transformers. A theoretical analysis of the transformer is given and good agreement is obtained with measurements made at X-band. Author

N84-20759*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PERFORMANCE OF ALKALINE BATTERY CELLS USED IN EMERGENCY LOCATOR TRANSMITTERS

Gilbert A. Haynes, Samuel Sokol, William R. Motley, III, and Edward L. McClelland Mar. 1984 60 p refs

(NASA-TP-2277; L-15496; NAS 1.60:2277) Avail: NTIS HC A04/MF A01 CSCL 09C

The characteristics of battery power supplies for emergency locator transmitters (ELT's) were investigated by testing alkaline zinc/manganese dioxide cells of the type typically used in ELT's. Cells from four manufacturers were tested. The cells were subjected to simulated environmental and load conditions representative of those required for survival and operation. Battery cell characteristics that may contribute to ELT malfunctions and limitations were evaluated. Experimental results from the battery cell study are discussed, and an evaluation of ELT performance while operating under a representative worst-case environmental condition is presented. S.L.

N84-20760# Royal Aircraft Establishment, Farnborough (England).

THE FLOW OF AN ELECTRORHEOLOGICAL SUSPENSION IN CELLS OF DIFFERENT GEOMETRIES

R. G. Gorodkin, G. M. Glokh, I. V. Bukovich, and T. A. Demidenko Jun. 1983 14 p refs Transl. into ENGLISH from Elektroreol. Issled. i Pril. (Minsk), 1981 p 52-65

(RAE-Trans-2111) Copyright. Avail: Issuing Activity

Using experimental evidence and simple models the modification of the electrorheological effect by three different electrode configurations (spiral ribbons, coaxial cylinders, and planar electrodes at various angles) and by other parameters (water content, mixing time, temperature, operating time and storage time) is described. Cells of variable geometry offer a useful means of regulating the electrorheological effect and that any loss of performance with life is associated with structural changes in the fluid, such as coagulation. Author

N84-20761# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

JDF-1 SMALL LIGHT-WEIGHT ELECTRIC EDDY CURRENT OSCILLATOR

Hang Ning 13 Jan. 1984 9 p Transl. into ENGLISH from Guoji Hangkong (China), no. 5, 1983 p 31

(AD-A137572; AD-E850486; FTD-ID(RS)T-1716-83) Avail: NTIS HC A02/MF A01 CSCL 09/3

Principles of operations, methods of use, and technical properties are discussed for a portable eddy current oscillator which need not come in contact with the test sample. The device can be used to measure and test the static frequency of lades, disks, plates, pipes, and other magnetic or nonmagnetic aircraft engine parts. The oscillations of laser holography can also be measured. A.R.H.

N84-20762# Air Force Systems Command Wright-Patterson AFB, Ohio. Foreign Technology Div.

MICROWAVE SEMICONDUCTOR EQUIPMENT PRODUCED IN POLAND

J. Klamka 20 Jan. 1984 36 p Transl. into ENGLISH from Elektron. (Poland), v. 21, no. 1-2, 1980 p 44-54

(AD-A137598; FTD-ID(RS)T-1884-83) Avail: NTIS HC A03/MF A01 CSCL 09/5

The history of the development of microwave semiconductor devices is given. Technological achievements are discussed. S.L.

N84-20763# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THEORY OF THE TWO-FREQUENCY OPERATING MODE OF TRAVELING-WAVE TUBES OF THE O TYPE

B. Y. Zhelezovskiy and V. V. Mashnikov 25 Jan. 1984 10 p Transl. into ENGLISH from Izv. Vyssh. Uch. Zaved., Radioelektron. (USSR), v. 12, no. 9, Sep. 1969 p 1094-1097

(AD-A137616; FTD-ID(RS)T-1812-83) Avail: NTIS HC A02/MF A01 CSCL 09/1

The results of the analysis of harmonics of the electron beam of a traveling wave tube with the simultaneous introduction into the input of two high frequency signals of different amplitudes and frequencies are reported. The examination is interesting from the viewpoint of interesting the general problem of multifrequency operating modes of SHF (microwave) devices. There is special interest in the development of the approximation methods of analysis, which permit obtaining simple analytical relations convenient for engineering calculations. Author

N84-20764# Defence Research Establishment, Ottawa. (Ontario). Div. de la Transformation de l'Energie.

A STUDY OF THE RECHARGEABILITY OF THE RED CAMEL LEAD-ACID BATTERY BETWEEN +20 DEG C AND -30 DEG C

L. Brossard, G. Verville, and R. W. Gorman Oct. 1983 22 p In FRENCH; ENGLISH summary

(AD-A137635; DREO-TN-83-36) Avail: NTIS HC A02/MF A01 CSCL 10/3

The rechargeability of a group 24 esb Red Camel, lead acid battery was measured between +20C and -30C. The current charge dropped considerably when the temperature was reduced below 0C. The current efficiency (Rc) and energy efficiency (Re) including recovery after rest, for an applied voltage of 14.3 v and charge time of seven hours were 92 + or - 6% and 62 + or - 4% respectively at temperatures below 0C. The rechargeability was improved at low temperatures when the applied voltage was increased at low temperatures when the applied voltage was increased from 13.7 to 14.3 v. Above 14.3 v, however, parasitic reactions prevented a further increase in rechargeability. Author

N84-20765# Magnetic Corp. of America, Waltham, Mass.

THE INSULATION OF COPPER WIRE BY THE ELECTROSTATIC COATING PROCESS Final Report, Mar. 1982 - Jun. 1983

M. G. H. Wells 30 Jun. 1983 95 p

(Contract DAAK70-82-C-0061)

(AD-A137715; MCA-USA04) Avail: NTIS HC A05/MF A01 CSCL 13/9

A review of the fluidized bed electrostatic coating process and materials available for application to flat copper conductor has been made. Lengths of wire were rolled and electrostatically coated with two epoxy insulations. Electrical tests were made in air on coated samples at room and elevated temperatures. Compatibility tests in the cooling/lubricating turbine oil at temperatures up to 220 deg. C were also made. Recommendations for additional work are provided. Author (GRA)

N84-20766# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.

VHSIC TECHNOLOGY WORKING GROUP REPORT (IDA/OSD

R&M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RELIABILITY AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
E. Maynard Nov. 1983 51 p
(Contract MDA903-79-C-0018)
(AD-A137720; AD-E500617; IDA-D-42; IDA/HQ-83-28203) Avail: NTIS HC A04/MF A01 CSCL 15/3

This document records the activities and presents the findings of the VHSIC Technology Working Group, part of the IDA/OSD Reliability and Maintainability Study, conducted during the period from July 1982 through August 1983. GRA

N84-20767# Innsbruck Univ. (Austria). Inst. of Experimental Physics.
TUNABLE FAR INFRARED SEMICONDUCTOR SOURCES Final Technical Report, 22 Oct. 1980 - 31 Dec. 1983
E. Gornik Jan. 1984 42 p
(Contract DAJA37-81-C-0046; DA Proj. 1T1-61102-BH-57)
(AD-A137777) Avail: NTIS HC A03/MF A01 CSCL 20/2

The concept of continuously tunable far infrared sources was investigated in magnetically and electrically tunable level systems. Landau emission has been investigated in several semiconductors. A useful source for spectroscopic investigations based on bulk GaAs with a resolution below 1 per cm has been developed in the spectral range from 20 to 120 per cm. New promising concepts for tunable sources have been demonstrated recently: A significant line narrowing of the Landau emission was observed from InSb under the presence of hydrostatic pressure above 8 kbar. For the first time tunable emission from spin-flip transitions in uniaxially stressed InSb was observed. Linewidths in the order of 0.2 per cm are found which opens the potential for high resolution spectroscopy with magnetically tunable sources. For the realization of voltage tunable sources based on the voltage tunable electron density in MOS-devices, three possible mechanisms were investigated: The radiative recombination between electric subbands, between minigaps induced by tilted interfaces in respect to the main crystallographic directions and the radiative decay of two dimensional plasma oscillations via periodic grating structures. GRA

N84-20768# University of Southern California, Los Angeles.
ON THE RELATION BETWEEN WIRE LENGTH DISTRIBUTIONS AND PLACEMENT OF LOGIC ON MASTER SLICE ICs Technical Report, 1 Aug. - 31 Oct. 1983
S. Sastry 28 Oct. 1983 22 p
(Contracts DAAG29-80-K-0083; DAAG29-83-K-0147)
(AD-A137848; DISC/83-7; ARO-17920.14-EL; ARO-20637.1-EL) Avail: NTIS HC A02/MF A01 CSCL 12/1

Paper presents a model that characterizes the relation between wire length distributions and placement of logic on master slice integrated circuits. In particular, the model provides a firm mathematical basis for the well known empirical law known as Rent's Rule. It is shown that Rent's Rule is a manifestation of a more fundamental underlying process characterized by a function from which the distribution of wire lengths can be recovered. That is, Rent's Rule contains all the information about the distribution of wire lengths. Based on this, estimates for the average wire length are derived. Finally, experimental results from both simulated and actual chips are presented. Author (GRA)

N84-20769# University of Southern California, Los Angeles. Center for Digital Integrated Systems.
A DATA STRUCTURE FOR VLSI SYNTHESIS AND VERIFICATION
David W. Knapp and Alice C. Parker 28 Oct. 1983 61 p
(Contracts DAAK20-80-C-0278; DAAG29-80-K-0083; Grant NSF MCS-82-03485)
(AD-A137880; DISC/83-6) Avail: NTIS HC A04/MF A01 CSCL 05/1

This document describes a VLSI design representation developed at USC as part of the USC Expert Synthesis System project. The data structure is implementation-independent and can be regarded as a general hardware design representation schema. It is characterized by four nonisomorphic hierarchies, which collectively describe the system under design. It is useful for the analytic detection of some kinds of design errors. Author (GRA)

N84-20770# Wisconsin Univ., Madison. Mathematics Research Center.
COMPUTATION OF CURRENT-VOLTAGE-CHARACTERISTICS IN A SEMICONDUCTOR DEVICE USING ARC-LENGTH CONTINUATION Technical Summary Report
Peter A. Markowich (Technische Univ., Vienna), Christian A. Ringhofer, and Alois Steindl (Technische Univ., Vienna) Dec. 1983 24 p
(Contract DAAG29-80-C-0041)
(AD-A137919; MRC-TSR-2605) Avail: NTIS HC A02/MF A01 CSCL 12/1

This paper presents an algorithm for the numerical computation of current-voltage-characteristics in a semiconductor device (i.e. curves describing the dependence of the output current on the input voltage at some contacts). For certain devices (e.g. thyristors) the set of equations describing the state of the semiconductor device have multiple solutions for specific voltage ranges and snap-back phenomena occur (i.e. the current is not a single valued function of the voltage). This implies that the characteristic cannot be computed numerically by merely stepping up the voltage. The algorithm involves reparameterizing the characteristics curve by means of a parameter which approximate the arclength of the curve. Continuation in this parameter past snap-back-points does not cause serious difficulty. The authors discuss the implementation of the reparameterization and present a numerical example. Author (GRA)

N84-20771# Sandia Labs., Albuquerque, N. Mex. Exploratory Batteries Div.
COMPLEX IMPEDANCE OF Ca/CaCrO4/Fe THERMAL BATTERIES
Ronald A. Guidotti and Frank M. Delnick Dec. 1983 16 p refs
(Contract DE-AC04-76DP-00789)
(DE84-005507; SAND-83-1523) Avail: NTIS HC A02/MF A01

The frequency dispersion of the complex impedance of 5-cell Ca/CaCrO4/Fe thermal batteries and related battery components were measured. The battery resistance was partitioned among its components (bulk DEB, interfacial reaction layers, and leads and intercell connectors) and the relative magnitudes determined. The ohmic and non-ohmic contributions to the battery voltage losses were evaluated. A possible mechanism for battery end of life is presented. DOE

N84-20772# California Univ., Livermore. Lawrence Livermore Lab. Electronics Engineering Dept.
PROGRESS IN RESEARCH IN ELECTRONICS ENGINEERING: TECHNICAL REVIEW
E. A. Lafranchi Dec. 1983 39 p refs
(Contract W-7405-eng-48)
(DE84-006389; UCRL-50025-83-3) Avail: NTIS HC A03/MF A01

Progress is in the following areas summarized: a microprocessor controlled octopus line switching network, implementation of CAMAC based interlocks on the mirror fusion test facility, fiber optics in the nuclear test program, protection circuits and instrumentation interface for long pulse MFTF neutral beams, and a high power pulsed microwave source designated MGX. DOE

N84-20773# Exxon Research and Engineering Co., Linden, N.J. Corporate Research-Technology Feasibility Center.
ZINC-BROMINE CELL DESIGN
Richard Bellows 30 Nov. 1983 25 p Presented at the Workshop on the Electrochem. of Zinc/Halogen Batteries, Palo Alto, Calif., 30 Nov. 1983
(Contract DE-AC04-76DP-00789)
(DE84-005532; SAND-83-7476C; CONF-8311134-1) Avail: NTIS HC A02/MF A01

A set of slides is reproduced which illustrates the design of a zinc-bromine circulating battery. Low cost manufacturing techniques and scale up rationale are outlined, and design parameters are

listed. A computer model of the zinc-bromine battery is outlined. DOE

N84-20774# North Carolina State Univ., Raleigh. Office of Productivity Research and Extension Program.
ELECTRONICS/ELECTRICAL MANUFACTURING INDUSTRY RESEARCH NEEDS Interim Technical Report, Dec. 1982 - Apr. 1983
William A. Smith, Jr. and Robert L. Edwards May 1983 85 p (Grant NSF MEA-82-16463)
(PB84-122969; CAM-83-2; NSF/MEA-83015) Avail: NTIS HC A05/MF A01 CSCL 13H

A panel established a reference base of current activity for electronics manufacturing research by reviewing conventional and microelectronics state-of-the-art; education regarding technology and management; and cooperative efforts being developed. The Department of Defense Electronics Computer-Aided Manufacturing (ECAM) program, the Computer-Aided Manufacturing-International (CAM-I) Electronics Automation Project, and the Microelectronics Center of North Carolina received special attention. Participants were divided into three separate work sessions to identify gaps and issues in technology or operations which limit manufacturing performance in the areas: Logistics and Control Systems; Automation and Assembly; and Quality and Test. The list of priority research issues will be used as the basis to assess the capabilities for responding to needs. GRA

N84-20775# National Bureau of Standards, Washington, D.C. National Engineering Lab.
THE CHARACTERISTICS OF IRIS-FED MILLIMETERWAVE RECTANGULAR MICROSTRIP PATCH ANTENNAS
D. H. Greenlee, M. Kanda, and D. C. Chang (Colorado Univ., Boulder) Oct. 1983 52 p refs
(PB84-134634; NBS-TN-1063) Avail: NTIS HC A04/MF A01 CSCL 09E

The fabrication of various iris-fed millimeterwave rectangular microstrip patch antennas is described. A model is proposed to describe the iris-fed antenna. Irises ranging in size from 15 percent of the area of the patch to the fully open waveguide are used to couple energy into the antenna. Resonance of the antenna is observed to be insensitive to the size of the iris for irises up to 115 percent of the size of the patch. A study is also made of the relationship of coupiing to the antenna as a function of the position of the iris with respect to the transverse plane of the waveguide, the iris always being centered with respect to the patch. In general, the antenna has a VSWR in the waveguide feed on the order of 5:1 at resonance, except for the fully open waveguide which gives rise to the VSWR of 2.9:1 at resonance. Author (GRA)

N84-21213# Telecom Australia Research Labs., Melbourne. Cable Design and Specifications Section.
USE OF PLAIN COPPER CONDUCTORS IN LIEU OF TINNED-COPPER FOR INTERNAL CABLES
Robert T. deBoer and Ken G. Mottram *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 1-8 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21214# Sumitomo Electric Industries Ltd., Kanuma (Japan). Electronics Wire Div.
DEVELOPMENT OF COPPER-COATED ALUMINUM-SHIELDED WIRE
Haruo Saen and Akinori Mori *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 9-16 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21215# Tobyhanna Army Depot, Pa. Production Engineering Div.
ALUMINUM FOIL SHIELD EFFECTIVENESS FOR ELECTRONIC CABLES
Michael R. Lombardo *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 17-23 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21217# Sumitomo Electric Industries Ltd., Yokohama (Japan). Communication System Engineering Section.
DESIGN AND CHARACTERISTICS OF RADIATING PAIR CABLE
Noriyuki Tago, Hiroshi Satani, Yoshio Miyamoto, and Yoshikazu Amano *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 30-36 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21218# Bell Telephone Labs., Inc., Holmdel, N. J. Transmission Systems Group.
NEW QUALITY ASSESSMENT PROCEDURE FOR EXCHANGE AREA CABLE TRANSMISSION PARAMETERS
P. Allen Link *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 37-44 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21219# Bell Telephone Labs., Inc., Norcross, Ga. Lightguide Joining Group.
BELL SYSTEM LIGHTGUIDE CABLE INTERCONNECTION EQUIPMENT, CENTRAL OFFICE TO CUSTOMER PREMISES
Manfred R. Gotthardt *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 45-48 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21220# Thomson-CSF, Conflans-Sainte-Honorine (France). L.T.T. Cable Div.
TERMINATION OF CYLINDRICAL GROOVED OPTICAL CABLES
Andre Bouvard, Jean Pierre Hulin (Raychem), Michel deVecchis, and William J. Poulson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 49-53 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21223# Furukawa Electric Co. Ltd., Tokyo (Japan). Fiber Optics Apparatus Group.
FABRICATION AND EVALUATION OF A HIGH DENSITY MULTI FIBER PLASTIC CONNECTOR
Shigeru Tachigami, Akihiro Ohtake, Takehiro Hayashi, Takaaki Iso, and Tohro Shirasawa *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 70-75 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21225# Firet B.V., Veenendaal (Netherlands).
LONGITUDINAL WATERBLOCKING PERFORMANCE OF CONDUCTIVE AND NON-CONDUCTIVE WATERSWELLABLE NONWOVENS
Ben J. Nieuwhof and Roelf deVrieze *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 83-87 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21227# Ciba-Geigy A.G., Basel (Switzerland). Polymer Additive Dept.
NEW DATA ON LONG TERM STABILIZATION OF POLYETHYLENE FOR TELECOMMUNICATION WIRE INSULATION
Felix K. Meyer and Helmut Linhart *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 94-104 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21229# Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Fluoropolymer Div.
EQUIPMENT AND DESIGN CHANGES IN EXTRUSION OF FOAMED FLUOROPOLYMER RESINS

Stuart K. Randa, Mark A. Carlson, and David P. Reifschneider *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 111-118 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21231# Sumitomo Electric Industries Ltd., Osaka (Japan). Photonics Project Group.
DEVELOPMENT OF COMPOSITE FIBER-OPTIC ELECTRIC-POWER UMBILICAL CABLE AND OPTICAL FEEDTHROUGH FOR DEEP OCEAN MINING
Tsutomu Mitsui, Takeshi Gomi, Tetsuji Ito, Shigefumi Ushitani, and Masayoshi Yamaguchi *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 125-133 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21234# Belden Corp., Chicago, Ill. Product Development Dept.
DESIGN ASPECTS OF LOOSE BUFFER TUBE FIBER OPTICS CABLE
Ronald L. Ohlhaber *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 151-154 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21235# Tohoku Electric Power Co., Inc., Sendai (Japan). Integrated Communication Network Development Office.
NON-METALLIC OPTICAL CABLE WITH OPTICAL FIBER CATENARY FOR LONG SPAN AERIAL APPLICATION
Eiji Hayasaka, Fujio Ohtsuk, Masaki Monma, Sakari Ohira, Hiroaki Horima (Sumitomo Electric Ind., Ltd.), Katsumi Yamashita (Sumitomo Electric Ind., Ltd.), Masahiko Dazai (Sumitomo Electric Ind., Ltd.), and Hoboru Abe (Kitanihon Electric Wire Co., Ltd.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 155-166 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21236# AEG-Telefunken, Moenchengladbach (West Germany). Optical Fiber Div.
NON-METALLIC LONG SPAN AERIAL CABLE WITH OPTICAL FIBRES FOR THE USE AT 1.3 MICROMETERS
Helmut G. Haag and Peter E. Zamzow *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 167-174 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21237# Dow Corning Corp., Midland, Mich.
NEW SILICON RUBBER CABLE INSULATION PROMISES CIRCUIT INTEGRITY, IN FLAMING ENVIRONMENT
Melvin A. Cabey *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 175-182 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21238*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A POLYTETRAFLUORETHYLENE INSULATED CABLE FOR HIGH TEMPERATURE OXYGEN AEROSPACE APPLICATIONS
Alvin T. Sheppard (Martin Marietta Aerospace) and Robert G. Webber *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 183-192 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09A

N84-21239# Standard Telecommunication Labs. Ltd., Harlow (England). Polymer Processing and Application Dept.
DEVELOPMENT OF FLAME RETARDANT, LOW AGGRESSIVITY CABLES
J. R. Bury and Brian A. Cranfield *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 193-199 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21240# Standard Telefon og Kabelfabrik A/S, Oslo (Norway). Power Cable Div.
LOW-SMOKE, HALOGENFREE SHIP-OFFSHORE/ONSHORE CABLES WITH IMPROVED FLAME RETARDANCE AND FIRE RESISTANCE
J. R. Pedersen, T. A. Holte, and E. Johansen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 200-205 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21242# Thomson-CSF, Conflans-Sainte-Honorine (France). L.T.T. Cable Div.
CYLINDRICAL V-GROOVED NON-METALLIC OPTICAL FIBRE CABLE
Michel deVecchis, J. P. Demey, Jean Pierre Hulin, J. Personne, and J. C. Staath *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 215-219 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21243# Kokusai Denshin Denwa Co. Ltd., Tokyo (Japan).
DESIGN AND TEST RESULTS OF OPTICAL FIBER UNITS FOR OPTICAL SUBMARINE CABLE
Hitoshi Yamamoto, Kihoyumi Mochizuki, Yoshinori Namihira, and Yasuhiko Niiro *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 220-227 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21244# Centre National d'Etudes des Telecommunications, Lannion (France). Optical Fibre and Cable Dept.
METAL-FREE CYLINDRICAL V-GROOVED OPTICAL CABLE
Georges LeNoane, Christian Audoux (Silec), Philippe Cheron (Silec), and Bernard Missout (Sat-Direction Technique Cable) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 228-235 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21245# Valtec, West Boylston, Mass. Cable Engineering Dept.
DESIGN, FABRICATION AND TESTING OF A RUGGEDIZED FIBEROPTIC CABLE
Harvey L. Blumsack, Paul J. Dobson, Dan Hurwitz, and Ishwar D. Aggarwal *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 236-242 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21246# Bell Telephone Labs., Inc., Norcross, Ga.
A RODENT AND LIGHTNING PROTECTIVE SHEATH FOR FIBER OPTIC CABLES
William C. L. Weinraub, Donald D. Davis, and Michael D. Kinard (Western Electric) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 243-249 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

N84-21248# International Business Machines Corp., Research Triangle Park, N.C. Polymers Group.
MATERIAL REQUIREMENTS FOR MULTIMEDIA COMMUNICATIONS CABLE
G. L. Grune *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 255-267 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21249# International Business Machines Corp., Research Triangle Park, N.C. Transmission Technology Development Dept.
DESIGN OF A TWISTED PAIR CABLE FOR A TOKEN PASSING LOCAL AREA NETWORK

Paul Abramson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 268-270 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21250# International Business Machines Corp., Research Triangle Park, N.C.
MEASUREMENT OF THE CHARACTERISTIC IMPEDANCE OF BALANCED TWISTED PAIRS USING SCATTERING PARAMETERS
R. Benton Hobgood *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 271-276 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21251# Siecor Corp., Hickory, N.C. Research and Development Group.
DESIGN/PROCESS OPTIMIZATION OF PAIRED COMPUTER INTERCONNECTING CABLE FOR LOCAL AREA NETWORKS
Edwin D. Laing *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 277-280 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21252# Anaconda-Ericsson, Inc., Overland Park, Kans. Electrical Engineering Lab.
EVALUATION OF FOAM-SKIN CABLES FOR AERIAL APPLICATIONS
Gene R. Samuelson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 281-286 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21255# Siecor Corp., Hickory, N.C.
RECENT DEVELOPMENTS IN MINI-UNIT CABLE
Derek O. Lawrence and Peter R. Bark *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 301-307 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21256# Centre National d'Etudes des Telecommunications, Lannion (France). Optical Fibers and Cables Dept.
MANUFACTURE CABLES WITH LOW LOSSES
Daniel Boscher, Bernard Nonclercq, Alain LeBoutet, and Bernard Missout (SAT-Direction Technique Cables) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 308-315 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21258# Valtec, West Boylston, Mass. Cable Research and Development Dept.
OPTICAL AND MECHANICAL PROPERTIES OF SINGLE MODE CABLES AT 1300 nm
Steven H. Veld, Peter H. Prideaux, Ishwar D. Aggarwal, Dan Hurwitz, and David Roland *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 323-329 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21259# Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Polymer Products Dept.
A NEW ENGINEERING APPROACH FOR CABLE IN FIRE SITUATIONS USING HALOGENATED POLYMERS
James R. Hoover, Albert L. Moran, Gerry C. Sweet, David B. Allen, Joseph G. DiPinto, Donald H. Lutz, and John O. Punderson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 330-347 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21260# Fujikura Ltd., Sakura (Japan). Optical Fiber and Cable Section.
CHARACTERISTICS OF HEAT AND FLAME RESISTANT OPTICAL FIBER CABLES
Yoshio Kikuchi, Akio Mogi, Toshiaki Kobayashi, Nobuyuki Misono, Toshiaki Murayama, and Yasuyuki Sugawara *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 348-353 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21270# Phalo Corp., Manchester, N.H. Optical Systems Div.
BREAKOUT CABLES FOR SHORT HAUL FIBER OPTIC SYSTEMS
F. T. McDuffee *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 436-444 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

N84-21343# Westinghouse Electric Corp., Pittsburgh, Pa.
CELL PERFORMANCE AND LIFE CHARACTERISTICS OF SOLID OXIDE ELECTROLYTE FUEL CELLS
Arnold O. Isenberg *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 5-15 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

N84-21344# Gas Research Inst., Chicago, Ill. Fuel Cell Technology.
CRITICAL ISSUES IN SOLID OXIDE FUEL CELL DEVELOPMENT
Diane Traub Hooie *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 17-27 (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

N84-21346# Westinghouse Electric Corp., Pittsburgh, Pa.
VAPOR DEPOSITION OF STABILIZED ZIRCONIUM OXIDE ELECTROLYTE AND LANTHANUM CHROMITE INTERCONNECTION FOR MULTIPLE CELL FABRICATION
Gregory E. Zymboly *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 39-44 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

N84-21362# Westinghouse Electric Corp., Pittsburgh, Pa.
AC MEASUREMENTS ON FUEL CELLS AND FUEL CELL COMPONENTS
James E. Bauerle *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 283-293 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

N84-21376*# EIC, Inc., Newton, Mass.
MODERATE TEMPERATURE RECHARGEABLE NaNiS2 CELLS
K. M. Abraham *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 95-105 refs (For primary document see N84-21368 11-76)
(Contract NAS3-21726)
Avail: NTIS HC A07/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics.*

N84-20776 Cornell Univ., New York, N.Y.
EXPERIMENTAL STUDY OF TURBULENT SWIRLING FLOWS

Ph.D. Thesis
Bach Thien Vu 1983 229 p
Avail: Univ. Microfilms Order No. DA8328695

The structure of turbulent coaxial swirling flows is studied in the present work to arrive at a better understanding of the flows with their characteristic recirculation zones and oscillatory behavior, and to provide an experimental data-base for development and evaluation of numerical models of turbulent swirling flows. Extensive flow field mapping of two confined coaxial jets under co-swirl and counter-swirl conditions are carried out. In one set of experiments, mean flow results are obtained with a directional pitot probe to determine the effect of outer swirl on the recirculation zone. As the outer swirl magnitude is first decreased from maximum counter-swirl and then increased to give co-swirl conditions, the size and the reverse flow velocity in the recirculation zone diminishes. In the second set of experiments, for a co-swirl and a counter-swirl condition, detailed maps of mean and fluctuation flow fields are obtained with pitot probe and hot-wire anemometry.
Dissert. Abstr.

N84-20777 Pennsylvania Univ., Philadelphia.
LAMINAR CONDENSATION HEAT AND MASS TRANSFER TO A DROP MOVING AT INTERMEDIATE OR HIGH REYNOLDS NUMBER Ph.D. Thesis
Thirumalachari Sundararajan 1983 161 p
Avail: Univ. Microfilms Order No. DA8326335

The hydrodynamics and the heat and mass transport associated with condensation on a moving drop were analytically and numerically investigated. The drop is surrounded by an infinite expanse of a mixture of saturated vapor and a noncondensable gas. The Reynolds number of drop translation is assumed to be in the laminar range ($0 < Re < 500$). The transport external to the drop is described by a quasi-steady model, while the transport inside is taken to be fully transient. The elliptic partial differential equations governing the gas phase transport, are solved by a finite difference numerical procedure. The transient heating of the drop inside is analyzed by a partly analytical scheme. For high Re motion, an alternate formulation based upon the boundary layer theory is also presented for transport in the gaseous phrase. A similarity solution valid in the vicinity of the front stagnation region and an approximate series solution for the entire boundary layer region are obtained through the boundary layer analysis.
Dissert. Abstr.

N84-20778# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
APPROXIMATION OF COMPRESSIBLE FLUID IN FLUID-STRUCTURE INTERACTION PROBLEMS
H. Neishlos Jan. 1983 12 p refs Presented at Intern. Symp. in Finite Elements and Design, Cape Town, Jan. 1983
(CSIR-R/NIAST-15) Avail: NTIS HC A02/MF A01

A short overview of some techniques for the approximation of compressible fluid in fluid-structure interaction problems is presented. Both the linear and nonlinear fluid is addressed. A deformable structure submerged in infinite fluid and subjected to loading by a transverse transient shock wave is considered as a modal problem.
S.L.

N84-20779# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AN EXPERIMENTAL AND NUMERICAL STUDY OF WEAK SPHERICAL N-WAVES PRODUCED BY EXPLODING WIRES Thesis
C. H. Wong Jan. 1984 190 p refs Sponsored in part by Natural Sciences and Engineering Research Council of Canada
(Grant AF-AFOSR-0096-82)
(UTIAS-Tech-Note-248; ISSN-0082-5263) Avail: NTIS HC A09/MF A01

The effects of vibrational excitation of oxygen molecules on the transition shape and thickness of shocks in weak, spherical N-waves produced in air by exploding tungsten wires was investigated experimentally and numerically. Extensive measurements were made in a still-air dome of the overpressure signatures of N-waves at distances ranging from 15 to 150 ft (4.6 to 45.7 m) from the exploding wires, over which the amplitude of the front shock decayed from 250 to 5 Pa and the positive-phase duration increased from 70 to 150 micro-sec. The amplitudes and rise times of both the front and near shocks, as well as the durations of the positive and negative phases, were taken from the measured N-wave signatures, tabulated and plotted. The experimental data were then compared to predicted results from a numerical simulation, by using the explosion of a pressurized air sphere as a model. The explosion flow field containing the outward moving spherical N-wave was computed by employing the random-choice method with an operator-splitting technique to solve the full Navier-Stokes equations, including the vibrational excitation of oxygen molecules. The experimental and numerical results are in fair agreement, and additional numerical work is recommended.
M.G.

N84-20780# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AN ANALYTICAL AND NUMERICAL STUDY OF THE INTERACTION OF RAREFACTION WAVES WITH AREA CHANGES IN DUCTS. PART 1: AREA REDUCTIONS
J. J. Gottlieb and T. Saito Nov. 1983 91 p refs Sponsored in part by Defence Research Establishment Suffield, Ralston, Alberta and the Natural Sciences and Engineering Council of Canada
(UTIAS-72; ISSN-0082-5255) Avail: NTIS HC A05/MF A01

The interaction of a rarefaction wave with a gradual monotonic area reduction of finite length in a duct, which produces transmitted and reflected rarefaction waves and other possible rarefaction and shock waves, was studied both analytically and numerically. A quasi-steady flow analysis which is analytical for an inviscid flow of a perfect gas was utilized first to determine the domains of and boundaries between four different wave patterns that occur at late times, after all local transient disturbances from the interaction process have subsided. These numerical results show clearly how the transmitted, reflected and other waves develop and evolve with time, until they eventually attain constant strengths, in agreement with quasi-steady flow predictions for the asymptotic wave patterns.
Author

N84-20781*# Systems and Applied Sciences Corp., Hampton, Va.
INTERACTION OF AERODYNAMIC NOISE WITH LAMINAR BOUNDARY LAYERS IN SUPERSONIC WIND TUNNELS Final Report
M. R. Schopper Washington NASA Apr. 1984 168 p refs
(Contract NAS1-16572)
(NASA-CR-3621; NAS 1.26:3621) Avail: NTIS HC A08/MF A01 CSCL 20D

The interaction between incoming aerodynamic noise and the supersonic laminar boundary layer is studied. The noise field is modeled as a Mach wave radiation field consisting of discrete waves emanating from coherent turbulent entities moving downstream within the supersonic turbulent boundary layer. The individual disturbances are likened to miniature sonic booms and the laminar boundary layer is staffed by the waves as the sources move downstream. The mean, autocorrelation, and power spectral density of the field are expressed in terms of the wave shapes and their average arrival rates. Some consideration is given to the possible appreciable thickness of the weak shock fronts. The emphasis in the interaction analysis is on the behavior of the shocklets in the noise field. The shocklets are shown to be focused by the laminar boundary layer in its outer region. Borrowing wave propagation terminology, this region is termed the caustic region. Using scaling laws from sonic boom work, focus factors at the caustic are estimated to vary from 2 to 6 for incoming shocklet strengths of 1 to .01 percent of the free stream pressure level. The situation regarding experimental evidence of the caustic region is reviewed.
Author

N84-20782*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VORTEX GENERATING FLOW PASSAGE DESIGN FOR INCREASED FILM COOLING EFFECTIVENESS Patent Application
S. Stephen Papell, inventor (to NASA) Filed 15 Feb. 1984 15 p
(NASA-Case-LEW-14039-1; US-Patent-Appl-SN-580419) Avail: NTIS HC A02/MF A01 CSCL 20D

A cooling fluid is injected into a hot flowing gas through a passageway in a wall which contains and is subject to the hot gas. The passageway is slanted in a downstream direction at an acute angle to the wall. A cusp shape is provided in the passageway to generate vortices in the injected cooling fluid thereby reducing the energy extracted from the hot gas for that purpose. The cusp shape increases both film cooling effectiveness and wall area coverage. The cusp may be at either the downstream or upstream side of the passageway, the former substantially eliminating flow separation of the cooling fluid from the wall immediately downstream of the passageway. NASA

N84-20783*# Applied Research Lab., State College, Pa.
A STUDY OF PUMP CAVITATION DAMAGE Final Report
Michael C. Brophy, David R. Stinebring, and Michael L. Billet 30 Nov. 1983 119 p refs
(Contract NAS8-34535)
(NASA-CR-170992; NAS 1.26:170992) Avail: NTIS HC A06/MF A01 CSCL 20D

The cavitation assessment for the space shuttle main engine high pressure oxidizer turbopump is documented. A model of the flow through the pump was developed. Initially, a computational procedure was used to analyze the flow through the inlet casing including the prediction of wakes downstream of the casing vanes. From these flow calculations, cavitation patterns on the inducer blades were approximated and the damage rate estimated. The model correlates the heavy damage on the housing and over the inducer with unsteady blade surface cavitation. The unsteady blade surface cavitation is due to the large incidence changes caused by the wakes of the upstream vanes. Very high cavitation damage rates are associated with this type of cavitation. Design recommendations for reducing the unsteady cavitation include removing the set of vanes closest to the inducer and modifying the remaining vanes. A.R.H.

N84-20784# Naval Ship Research and Development Center, Bethesda, Md.
INVESTIGATION OF A PNEUMATIC THRUST DEFLECTOR BASED ON CIRCULATION CONTROL TECHNOLOGY Final Report
Michael J. Harris Feb. 1983 24 p refs
(Contract MIPR-FY-1456-81-00017)
(AD-A128950; DTNSRDC/ASED-83-01) Avail: NTIS HC A02/MF A01 CSCL 13/7

The potential of a pneumatic thrust deflector based on circulation control technology was validated. This thrust deflector consists of a small blown curved surface mounted adjacent to a two dimensional nozzle. In the configuration evaluated, a 3.5-in. (8.9-cm) -diameter blown surface was used to deflect the exhaust of a 660-lb (2.94-kN) thrust turbojet. Thrust deflection through 65 deg was achieved at reduced thrust levels. This performance was achieved pneumatically without the use of complex moving mechanical parts. GRA

N84-20785# Washington State Univ., Pullman. Shock Dynamics Lab.
ELECTRONIC SPECTRA OF CONDENSED PHASE UNDER SHOCK CONDITIONS Annual Summary Report, 1 Jul. 1982 - 30 Jun. 1983
George E. Duvall Aug. 1983 50 p
(Contract N00014-77-C-0232)
(AD-A137531; AD-E301319) Avail: NTIS HC A03/MF A01 CSCL 20/4

During the last 30 years a substantial amount of information has accumulated on non-explosive reaction in shock waves. It suggests that the effect of a shock wave in producing chemical reactions goes beyond the simple effects of pressure and temperature. There may be direct interaction between the shock front and the individual molecules which influences their chemical states. There are also large, heterogeneous electric fields and charge distributions in insulating solids, and probably in liquids too. These may be expected to be altered in the shock front and to contribute to the total reaction process. Plausible mechanisms of direct interaction between shock front and molecules include direct transfer of energy to particular modes, molecular deformation through impact, and torsion of large molecules. Research being conducted under this contract addresses the above problems directly using the best diagnostic technique presently available which is suited to the shock environment, viz., optical spectroscopy in the visible and UV regions. The subject material to date has been principally liquid carbon disulfide. GRA

N84-20786# Naval Postgraduate School, Monterey, Calif.
DETERMINATION OF BOUNDARY LAYER TRANSITION AND SEPARATION ON DOUBLE CIRCULAR ARC COMPRESSOR BLADES IN A LARGE SUBSONIC CASCADE M.S. Thesis
Alan G. McGuire Sep. 1983 73 p
(AD-A137550) Avail: NTIS HC A04/MF A01 CSCL 20/4

The china clay technique for flow visualization was used to determine the surface flow on a double circular arc (DCA) compressor blade in large rectilinear subsonic cascade wind tunnel. A calibration experiment using a large flat plate model is also reported which allowed the drying patterns on the DCA blading to be interpreted. Natural transition occurred on the flat plate at a Reynolds Number based on transition location of 0.8 million and on the suction surface of the DCA blading at significant negative incidence angles at a Reynolds Number based on transition location of approximately 0.5 million. At incidence angles larger than -3 deg, the DCA blade showed a leading edge separation bubble with turbulent reattachment. Author (GRA)

N84-20787# Iowa Univ., Iowa City. Inst. of Hydraulic Research.
UNSTEADY TURBULENT BOUNDARY LAYERS Final Technical Report, 15 Dec. 1978 - 30 Sep. 1982
B. R. Ramaprian 1 Dec. 1983 34 p
(Grant DAAG29-79-G-0017)
(AD-A137853; IIHR-TC-3; ARO-15780.7-EG) Avail: NTIS HC A03/MF A01 CSCL 20/4

A comprehensive study of periodic turbulent boundary layers and pipe flows has been completed. The study has resulted in the identification of the various operating regimes of these flows and the appropriate parameters to characterize them. Comprehensive experimental data on the mean and turbulent properties of these flows, obtained using laser Doppler anemometry, have been archived on magnetic tape. Author (GRA)

N84-20788# Illinois Univ., Urbana. Dept. of Chemical Engineering.
A STUDY OF THE COHERENT STRUCTURES IN THE VISCOUS WALL REGION OF A TURBULENT FLOW
Christos Nikolaides and Thomas J. Hanratty Nov. 1983 361 p
(Contract N00014-82-K-0324; NR Proj. 657-728)
(AD-A137875; TR-3) Avail: NTIS HC A16/MF A01 CSCL 20/4

Conditionally averaged measurements of flow in the viscous wall region showed that strong spanwise flows at $y(+) = 40$ are related to strong spanwise flows at the wall that are of the opposite sign. At $y(+) = 20$ spanwise flows are always in phase with flows at the wall. Characteristics of the dominant eddies at the wall were explored by performing numerical computations using a fixed cell in space. Close to the edge of the viscous sublayer ($y(+) = 15$) use of a single spatial harmonic ($lambda(+) = 100$) was found to be adequate in predicting all important features of turbulence. At the edge of the viscous wall layer two spatial harmonics were found to be necessary to describe the flow field. The longer scale outer flow eddies produce most of the spanwise mixing in the wall region. The smaller scale $lambda(+) = 100$ eddies can account for momentum transport, Reynolds stress production and creation of mean u squared and mean v squared

energy in this region. The physical picture of the flow resulting mean u squared and mean v squared from interaction of the wall with the outer layer is as follows. The mean flow energy is primarily produced in the outer layer by the mean pressure gradient and is subsequently transferred into viscous wall region. All the turbulent kinetic energy is produced by the v-w flow in the wall layer and is concentrated in the streamwise component of the velocity. This energy is convected out of the wall layer into the core region, where part of it is transferred to motion of the y-z plane. The cycle of events completes with the transport of mean v squared energy into the wall region and set-up of the v-w field. GRA

N84-20789# Illinois Univ., Urbana. Dept. of Chemical Engineering.
TURBULENT FLOW OVER SMALL AMPLITUDE SOLID WAVES
Jonathan Abrams and Thomas J. Hanratty Jan. 1984 280 p
(Contract N00014-82-K-0324; NR Proj. 657-728)
(AD-A137876; TR-4) Avail: NTIS HC A13/MF A01 CSCL 20/4

Measurements were made of the variation of wall shear stress and of the root mean square level of the fluctuating shear stress along a solid wavy surface with an amplitude of 0.014 in. and a wavelength of 2 in. The phase angle associated with the spatial variation of the wave-induced shear stress passes through a well defined maximum when measured as a function of the dimensionless wave number, alpha = 2 pi nu/lambda u star. Measurements of the wall shear stress and in particular the location of this maximum provide an extremely sensitive test of turbulence models which pay particular attention to the viscous wall region. The use of a quasi-laminar assumption, whereby the wave induced changes of the Reynolds stresses are ignored, gives good agreement with the measurements of the variation of the wall shear stress for large values of alpha. An equilibrium turbulence assumption in which the wave induced Reynolds stresses are assumed to adjust instantaneously to changes in flow conditions along the wave surface is valid for only small values of alpha. In the range of $0.0005 < \text{alpha} < 0.2$ it is necessary to use a model for wave induced Reynolds stresses which takes account of the fact that the turbulence does not respond immediately to changes in the flow conditions. The mixing length model of Loyd et al. provides the best fit of the data. A modification of this model which takes into account the effect of streamline curvature on the mixing length provides an improved fit of the available pressure measurements over over a wavy surface. GRA

N84-20790# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
COMPUTATION OF VISCOUS FLOW ABOUT ADVANCED PROJECTILES Final Report, 15 Oct. 1980 - 30 Sep. 1983
Joseph L. Steger 9 Sep. 1983 121 p
(Contract DAAG29-81-K-0013)
(AD-A137935; SUDAA-CFD-83-2; ARO-18000.3-EG) Avail: NTIS HC A06/MF A01 CSCL 20/4

The research program has been aimed at developing computational procedures for simulation of flow about projectiles. This final report includes summaries on numerical algorithm developments, methods of grid generation, and descriptions of flow field solution codes for projectiles in the transonic range. Author (GRA)

N84-20791# Ballistic Research Labs., Aberdeen Proving Ground, Md.
FURTHER ANALYSIS OF YAWSONDE DATA FROM SOME LIQUID PAYLOAD PROJECTILES Final Report
Russell L. Pope (Defence Research Center, Australia) 11 Dec. 1983 82 p Supersedes ARBRL-IMR-787
(DA Proj. 1L1-62618-AH-80)
(AD-A137256; AD-F300371; ARBRL-MR-03329; ARBRL-IMR-787) Avail: NTIS HC A05/MF A01 CSCL 19/1

Theoretical methods have recently been developed for predicting side moments and rolling moments created by a liquid payload on a spinning, coning projectile. A substantial amount of flight data is available from liquid payload projectiles fitted with yawsondes. There is also considerable data available from laboratory gyroscopes. To facilitate comparisons of flight measurements with theoretical results and with the experimental data base obtained from gyroscope experiments, data from some of the unstable liquid payload rounds have been analyzed in some detail. GRA

N84-20792# Ballistic Research Labs., Aberdeen Proving Ground, Md.
REFLECTED OVERPRESSURE IMPULSE ON A FINITE STRUCTURE Final Report
Charles N. Kingery and George A. Coulter Dec. 1983 58 p
(DA Proj. 4A6-65805-M-857)
(AD-A137259; AD-F300374; ARBRL-TR-02537) Avail: NTIS HC A04/MF A01 CSCL 19/4

The effect of angle of incidence of the shock front on reflected impulse loading on a finite structure is presented in this report. Impulse reflection factors have been developed for angles of incidence from zero to ninety degrees. Reflected impulse on a finite structure is much less than reflected impulse on an infinite plane because of the unloading due to rarefaction waves propagation from the sides of the structure which lowers the reflected overpressure. GRA

N84-20793# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
TECHNICAL AND ECONOMIC FEASIBILITY OF STIRLING CYCLE INDUSTRIAL HEAT PUMPS Final Report
Dec. 1983 382 p refs
(Contract DE-AC07-82ID-12239)
(DE84-005486; DOE/ID-12239/T1) Avail: NTIS HC A17/MF A01

The technical and economic feasibility of Stirling cycle industrial heat pumps (SCHIP) was evaluated. The objective selection of four industrial processes and four Stirling cycle industrial heat pump concepts are detailed. Over 16 industrial heat pump concepts are considered. Performance and cost calculations are prepared for 33 industrial process/thermodynamic cycle combinations and over 12 mechanical configurations are evaluated for their reliability, maintainability, development risk and product characteristics. DOE

N84-20794# California Univ., Irvine. Dept. of Mechanical Engineering.
EFFECT OF SOLID PARTICLES ON THE TURBULENT FLOW OF A ROUND GASEOUS JET: A MATHEMATICAL AND EXPERIMENTAL STUDY Final Technical Report
S. E. Elghobashi and M. A. Rizk Dec. 1983 78 p refs
(Grant DE-FG22-80PC-30303)
(DE84-005830; DOE/PC-30303/5) Avail: NTIS HC A05/MF A01

The effect of solid particles on the flow structure of an axisymmetric turbulent incompressible jet was studied. A two equation turbulence model was developed for predicting two phase flows. The two equations describe the conservation of turbulence kinetic energy and dissipation rate of that energy for the carrier fluid in a two phase flow. Closure of the time mean equations is achieved by modeling the turbulent correlations up to third order. The objectives of the experiment are: (1) to provide as much information as possible about the mean and turbulent quantities to enhance the understanding of the occurring physical phenomena; (2) to establish a data base with enough details to assist the development and validation of mathematical models of turbulent two phase flows. A two color laser anemometer measured the mean and fluctuating velocity components along the axial and radial directions and the corresonding component of the turbulent shear stress. Results for moderate loading ratios are presented. The conditions at the jet exit plane is emphasized since it is essential for definite evaluation of mathematical models of turbulent two phase flows. It is indicated that the present mathematical model allows the correct simulation of the two phase turbulent jet. DOE

N84-20795# Oak Ridge National Lab., Tenn. Energy Div.
COMPARISON OF FIELD PERFORMANCE OF A HIGH EFFICIENCY HEAT PUMP WITH AND WITHOUT A DESUPERHEATER WATER HEATER

Van D. Baxter 1984 15 p refs Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Engr. Meeting, Atlanta, 28 Jan. - 1 Feb. 1984
(Contract W-7405-eng-26)
(DE84-005816; CONF-840124-1) Avail: NTIS HC A02/MF A01

An air to air heat pump run alternately with a electric resistance water heater and a desuperheater water heater was tested under field conditions at a site near Knoxville, TN. It is indicated that the desuperheater system has an annual performance factor 14% better than that of the system using electric resistance water heating. An analytical model predicts a 21% improvement over an entire year with average weather for the desuperheater system. The simple payback period ranges from 7 years to about 9 years. DOE

N84-20796# California Univ., Berkeley. Lawrence Berkeley Lab.
ACCURACY OF VORTEX METHODS Ph.D. Thesis
Mirta Beatriz Perlman Dec. 1983 56 p refs
(Contract DE-AC03-76SF-00098)
(DE84-005714; LBL-17091) Avail: NTIS HC A04/MF A01

The accuracy of the vortex method depends on the choice of the cutoff function, of the cutoff length delta and on the initialization of the vorticity distribution. The practical effect of the choices on the vortex method for inviscid flows in the absence of boundaries was investigated. It is shown that the vorticity is radially symmetric and has bounded support. The consistency error and its components, the smoothing error and the discretization error for high order cutoff functions and several values of the cutoff length delta are considered. It is indicated that for smooth flows, high order cutoffs improve the accuracy of the approximation. The best value of delta is larger than h, the initial distance between the vortices; it is time dependent in the sense that longer time integration requires a larger delta. The optimal choice of delta is insensitive to the smoothness of the flow. If delta is close to h then the accuracy is lost in a relatively short time. This loss of accuracy is caused by the growth of the discretization error. DOE

N84-20797# California Univ., Berkeley. Lawrence Berkeley Lab.
NUMERICAL STUDY OF KELVIN-HELMHOLTZ INSTABILITY BY THE POINT VORTEX METHOD Ph.D. Thesis
Robert Krasny Dec. 1983 82 p refs
(Contract DE-AC03-76SF-00098)
(DE84-006613; LBL-17092) Avail: NTIS HC A05/MF A01

Rosenhead's classical point vortex numerical method for studying the evolution of a vortex sheet from analytic initial data (Kelvin-Helmholtz instability) is examined by the discrete Fourier analysis techniques. One cause for the chaotic motion previously observed in computations using a large number of vortices is that short wavelength perturbations are introduced spuriously by finite precision arithmetic and become amplified by the model's dynamics. The formation of a singularity in a finite time which was previously found by Moore and Meiron, Baker and Orszag using different techniques of analysis was confirmed. The point vortex approximation remains consistent at the critical time. The singularity is interpreted physically as a discontinuity in the strain rate along the vortex sheet and also as the start of roll up on a small scale. Some aspects of the dependence of the solution on the initial condition were studied and agreement with Moore's asymptotic relation between the initial amplitude and the critical time was found. For large initial amplitudes, two cusps form in the sheet strength, corresponding to double roll up. It is explained why the Poincare recurrence theorem does not imply that the sheet will eventually unroll. It is suggested that beyond the critical time, the vortex sheet becomes a spiral with infinite arc length. DOE

N84-20798# Rockwell International Corp., Richland, Wash. Energy Systems Group.
NUMERICAL MODELING OF PARAMETRIC UNCERTAINTIES IN FLOW THROUGH POROUS MEDIA: DEVELOPMENT AND INITIAL TESTING OF PORSTAT
Budhi Sagar (Analytic and Computational Research, Inc.) and Peter M. Clifton Jul. 1983 66 p refs
(Contract DE-AC06-77RL-01030)
(DE84-006682; RHO-BW-CR-140P) Avail: NTIS HC A04/MF A01

The advantages of a stochastic approach for repository analysis are outlined. They are: (1) the likelihood of model predictions can be quantified, and (2) information can be gained about how to reduce the uncertainty in these predictions. The PORSTAT solves the stochastic ground water flow equation coupled with the deterministic heat transfer and mass transport equations. An integrated finite difference numerical scheme is used in PORSTAT to solve the governing equations. The stochastic groundwater flow equation is approximated by a second order uncertainty analysis technique. Stochastic variables input to PORSTAT may be hydraulic conductivity, specific storage, boundary conditions, and initial conditions. The output from PORSTAT consists of the expected values and covariances of hydraulic heads and Darcian velocities. PORSTAT will be used to stochastically model groundwater flow in the thermally influenced zone around the repository. The results from two test cases run by PORSTAT and BWIP's Monte Carlo groundwater flow computer code (MAGNUM-MC) are compared. It is shown that PORSTAT tends to overestimate the uncertainty in hydraulic head predictions. DOE

N84-20799# Sandia Labs., Albuquerque, N. Mex. Aeroballistics Div.
NUMERICAL SOLUTION FOR A SPINNING, NUTATING, FLUID-FILLED CYLINDER
Harold R. Vaughn, William L. Oberkampf, and Walter P. Wolfe Dec. 1983 63 p refs
(Contract DE-AC04-76DP-00789)
(DE84-005878; SAND-83-1789) Avail: NTIS HC A04/MF A01

The incompressible, three dimensional Navier-Stokes equations are solved numerically for a fluid filled cylindrical cannister that is spinning and nutating. The motion of the cannister is characteristic of that experienced by spin stabilized artillery projectiles. Equations for the internal fluid motion are derived in a noninertial, aeroballistic coordinate system. Steady state numerical solutions are obtained by an iterative finite difference procedure. Flow fields and liquid induced moments have been calculated for viscosities in the range of 0.9 x 10 to the 4th power to 1 x 10 to the 9th power centistokes. The calculated moments agree favorably with experimental measurements. These results have direct application to analyzing the flight stability of spinning flight vehicles having highly viscous liquid payloads. DOE

N84-20800# California Univ., Livermore. Lawrence Livermore Lab.
NUMERICAL SIMULATIONS OF COMPLIANT MATERIAL RESPONSE TO TURBULENT FLOW
Alfred C. Buckingham, Mary S. Hall, and Ramsey C. Chun Dec. 1983 13 p refs Presented at the AIAA 22nd Aerospace Sci. Meeting, Reno, Nev., 9-12 Jan. 1984
(Contract W-7405-eng-48)
(DE84-004365; UCRL-89400; CONF-840133-4) Avail: NTIS HC A02/MF A01

Homogeneous and internally structured material coatings were studied numerically as candidates for drag and turbulence generated noise reduction on submersible hulls. Dynamic motions of compliant surfaces may conceptually interrupt random turbulent motions, reducing the turbulent interface stresses and absorbing turbulent energy, and consequently reducing the turbulence at the flow/coating interface. Time dependent, noninteractive, two and three dimensional Monte Carlo turbulent pressure field models, interactive potential flow models, and interactive Navier-Stokes pseudo spectral methods are used to represent the unsteady flow, while time-explicit finite element methods are applied to represent a variety of homogeneous layered, and internally structured material coatings. Attention is given to development and testing of an efficient but dynamically interactive fluid/solid interface coupling method, for two or three dimensional response simulations. The influence of added mass and of depth overburden on the material response in ocean water is discussed. Promising compliant material coatings include sandwiches of soft, homogeneous layers between thin, stiffer elastic materials and internally

structured coatings combining streamwise ribs, spanwise voids and elastically deforming intervening stiffeners. DOE

N84-20801# Los Alamos Scientific Lab., N. Mex.
STABILITY OF PLANAR MULTIFLUID PLASMA EQUILIBRIA BY ARNOLD'S METHOD
Darryl D. Holm 1983 27 p refs Presented at the Am. Math. Soc. Res. Conf. on Fluids and Plasmas, Geometry and Dyn., Boulder, Colo., 17 Jul. 1983
(Contract W-7405-eng-36)
(DE84-004332; LA-UR-83-3523; CONF-8307112-1) Avail: NTIS HC A03/MF A01

A method developed by Arnold to prove nonlinear stability of certain steady states for ideal incompressible flow in two dimensions is extended to the case of barotropic, compressible, multifluid plasmas. This extension is accomplished by constructing conserved functionals derived from degeneracy of Poisson brackets. The results are applied to planar shear flows of the plasma. DOE

N84-20802# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Chemical Engineering.
NUMERICAL STUDY OF HEAT TRANSFER IN TURBULENT SHEAR FLOW
Brian R. Circelli and John B. McLaughlin 1984 21 p refs
(Contract DE-AC02-82ER-12033)
(DE84-005106; DOE/ER-12033/T1) Avail: NTIS HC A02/MF A01

Results are presented for the heat flux and the intensity of temperature fluctuations obtained by solving a modification of the forced convection equation in which a mixing length profile is imposed on the spanwise and longitudinal average of the temperature field for points lying outside the wall region. The results for steady turbulent flow are shown to be in good agreement with the available experimental data. Results are also presented for unsteady turbulent flow which indicate that the heat flux exhibits a strong phase dependence. DOE

N84-20526*# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering.
MEASUREMENTS IN LIQUID FUEL SPRAYS
Norman Chigier *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 1-15 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20527*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUEL SPRAY DIAGNOSTICS
Maria A. Bosque *In its* Combust. Fundamentals Res. Apr. 1984 p 17-21 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20531*# Aerodyne Research, Inc., Bedford, Mass. Center for Chemical and Environmental Physics.
AUTOMATIC HOLOGRAPHIC DROPLET ANALYSIS FOR LIQUID FUEL SPRAYS
Alan C. Stanton, Gerald W. Stewart, and H. John Caulfield *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 51-54 refs (For primary document see N84-20525 11-07)
(Contract NAS3-24094)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20533*# California Univ., Irvine. Dept. of Mechanical Engineering.
EFFECT OF LIQUID DROPLETS ON TURBULENCE STRUCTURE IN A ROUND GASEOUS JET
A. M. Mostafa and S. E. Elghobashi *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 67-75 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20538*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NUMERICAL MODELING OF TURBULENT FLOW
R. W. Claus *In its* Combust. Fundamentals Res. Apr. 1984 p 97 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20539*# Argonne National Lab., Ill.
ADVANCED NUMERICS FOR MULTI-DIMENSIONAL FLUID FLOW CALCULATIONS
S. P. Vanka *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 99-102 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20541*# United Technologies Research Center, East Hartford, Conn.
MASS AND MOMENTUM TRANSPORT EXPERIMENTS WITH SWIRLING FLOW
Bruce V. Johnson and Richard Roback *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 115-124 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20542*# Connecticut Univ., Storrs. Dept. of Mechanical Engineering.
THE INFLUENCE OF LARGE-SCALE MOTION ON TURBULENT TRANSPORT FOR CONFINED COAXIAL JETS
David C. Brondum and John C. Bennett *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 125-129 refs (For primary document see N84-20525 11-07)
(Grant NAG3-350)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20543*# Stanford Univ., Calif. Dept. of Mechanical Engineering.
VELOCITY VISUALIZATION IN GASEOUS FLOWS
R. K. Hanson, B. Hiller, C. Hassa, and R. A. Booman *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 131-138 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20544*# Oklahoma State Univ., Stillwater.
INVESTIGATIONS OF FLOWFIELDS FOUND IN TYPICAL COMBUSTOR GEOMETRIES
David G. Lilley *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 139-151 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20546*# Michigan State Univ., East Lansing. Dept. of Mechanical Engineering.
FREE STREAM TURBULENCE AND DENSITY RATIO EFFECTS ON THE INTERACTION REGION OF A JET IN A CROSS FLOW
C. E. Wark and J. F. Foss *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 163-174 (For primary document see N84-20525 11-07)
(Grant NAG3-245)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20547*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MODELING OF DILUTION JET FLOWFIELDS
J. D. Holdeman and R. Srinivasan (Garrett Turbine Engine Co.) *In its* Combust. Fundamentals Res. Apr. 1984 p 175-187 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20548*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
TURBULENCE CHARACTERISTICS OF AN AXISYMMETRIC REACTING FLOW
Richard D. Gould, Warren H. Stevenson, and H. Doyle Thompson

In NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 189-198 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 21E

N84-20549*# Flow Research, Inc., Cambridge, Mass.
DIRECT NUMERICAL SIMULATION OF REACTING FLOWS
James J. Riley and Ralph W. Metcalfe *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 199-221 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20550*# Arizona State Univ., Tempe.
CHARACTERISTICS OF INHOMOGENEOUS JETS IN CONFINED SWIRLING AIR FLOWS
Ronald M. C. So and S. A. Ahmed *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 223-236 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20D

N84-20720# South African Inst. of Refrigeration and Air Conditioning, Pretoria.
DESIGN AND APPLICATION OF TWO STAGE EVAPORATIVE COOLING SYSTEMS
D. C. Cumming (C. E. Janeke and Partners) and D. M. Hawkins (Air-Dale Engineering Co. (Pty), Ltd.) *In its* Frigair 1983: Papers 1983 14 p (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

N84-20727# Lehigh Univ., Bethlehem, Pa.
LATE DEVELOPMENTS IN THE FIELD OF HEAT RECOVERY
A. I. McFarlan *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 26 p refs (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

N84-20728# Chamber of Mines, Johannesburg (South Africa). Environmental Engineering Lab.
INVESTIGATIONS INTO THE USE OF ICE FOR COOLING DEEP MINES
T. J. Sheer *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 15 p refs (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources.* For related information see also *06 Aircraft Instrumentation,* and *19 Spacecraft Instrumentation.*

N84-20803# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
INTAC: DIGITAL AND ANALOG CIRCUIT TEST STATIONS [ESTACOES DE TESTE DE CIRCUITOS DIGITAIS E ANALOGICOS INTAC]
May 1983 18 p refs In PORTUGUESE; ENGLISH summary Presented at 10th Integrated Software and Hardware Conf., Campinas, Brazil, 25-30 Jul. 1983 Submitted for publication
(INPE-2741-Pre/320) Avail: NTIS HC A02/MF A01

Test stations used in the INTAC automatic test system for digital and analog circuits are presented. Real time test is achieved by controlling the clock of unit under test. Analog signal is handled by test stations by means of digital techniques. Author

N84-20804*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TENSILE TESTING APPARATUS Patent Application
Linda B. Blackburn and John R. Ellingsworth, inventors (to NASA) Filed 19 Mar. 1984 21 p
(NASA-Case-LAR-13243-1; US-Patent-Appl-SN-590923) Avail: NTIS HC A02/MF A01 CSCL 14B

A mechanical extensometer for use with a constant load creep test machine is disclosed in which the dead weight of the extensometer is counterbalanced by two pairs of weights connected through a pulley system to rod extensions leading into the furnace where test sample is undergoing elevated temperature (above 500 F) tensile testing. Gripper surfaces, conical tip and flat surface, are provided in each sample engaging platens to reduce the grip pressure normally required for attachment of the extensometer to the specimen and reduce initial specimen bending normally associated with foil-gage metal testing. NASA

N84-20805*# Green Mountain Radio Research Co., Winooski, Vt.
POLARIZED-INTERFEROMETER FEASIBILITY STUDY Final Report, Sep. 1982 - Jun. 1983
Frederick H. Raab Jul. 1983 132 p
(Contract NAS8-34960)
(NASA-CR-170979; NAS 1.26:170979) Avail: NTIS HC A07/MF A01 CSCL 14B

The feasibility of using a polarized-interferometer system as a rendezvous and docking sensor for two cooperating spacecraft was studied. The polarized interferometer is a radio frequency system for long range, real time determination of relative position and attitude. Range is determined by round trip signal timing. Direction is determined by radio interferometry. Relative roll is determined from signal polarization. Each spacecraft is equipped with a transponder and an antenna array. The antenna arrays consist of four crossed dipoles that can transmit or receive either circularly or linearly polarized signals. The active spacecraft is equipped with a sophisticated transponder and makes all measurements. The transponder on the passive spacecraft is a relatively simple repeater. An initialization algorithm is developed to estimate position and attitude without any a priori information. A tracking algorithm based upon minimum variance linear estimators is also developed. Techniques to simplify the transponder on the passive spacecraft are investigated and a suitable configuration is determined. A multiple carrier CW signal format is selected. The dependence of range accuracy and ambiguity resolution error probability are derived and used to design a candidate system. The validity of the design and the feasibility of the polarized interferometer concept are verified by simulation. S.L.

N84-20806*# ITT Aerospace/Optical Div., Fort Wayne, Ind. Electro-Optical Systems Dept.
IMAGE DISSECTOR CAMERA SYSTEM STUDY Final Report
Larry Howell Mar. 1984 53 p refs Revised
(Contract NAS9-16923)
(NASA-CR-171759; NAS 1.26:171759) Avail: NTIS HC A04/MF A01 CSCL 14E

Various aspects of a rendezvous and docking system using an image dissector detector as compared to a GaAs detector were discussed. Investigation into a gimbled scanning system is also covered and the measured video response curves from the image dissector camera are presented. Rendezvous will occur at ranges greater than 100 meters. The maximum range considered was 1000 meters. During docking, the range, range-rate, angle, and angle-rate to each reflector on the satellite must be measured. Docking range will be from 3 to 100 meters. The system consists of a CW laser diode transmitter and an image dissector receiver. The transmitter beam is amplitude modulated with three sine wave tones for ranging. The beam is coaxially combined with the receiver beam. Mechanical deflection of the transmitter beam, + or - 10 degrees in both X and Y, can be accomplished before or after it is combined with the receiver beam. The receiver will have a field-of-view (FOV) of 20 degrees and an instantaneous field-of-view (IFOV) of two milliradians (mrad) and will be electronically scanned in the image dissector. The increase in performance obtained from the GaAs photocathode is not needed to meet the present performance requirements. M.A.C.

N84-20807*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CROSSED HOT-WIRE DATA ACQUISITION AND REDUCTION SYSTEM
R. V. Westphal and R. D. Mehta Jan. 1984 43 p refs (NASA-TM-85871; A-9579; NAS 1.15:85871) Avail: NTIS HC A03/MF A01 CSCL 14B

The report describes a system for rapid computerized calibration acquisition, and processing of data from a crossed hot-wire anemometer is described. Advantages of the system are its speed, minimal use of analog electronics, and improved accuracy of the resulting data. Two components of mean velocity and turbulence statistics up to third order are provided by the data reduction. Details of the hardware, calibration procedures, response equations, software, and sample results from measurements in a turbulent plane mixing layer are presented. S.L.

N84-20808*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LABORATORY GLASSWARE RACK FOR SEISMIC SAFETY Patent Application
Marc M. Cohen, inventor (to NASA) Filed 16 Aug. 1983 18 p (NASA-Case-ARC-11422-1; US-Patent-Appl-SN-523991) Avail: NTIS HC A02/MF A01 CSCL 14B

A rack for laboratory bottles and jars for chemicals and medicines was designed to provide the maximum strength and security to the glassware in the event of a significant earthquake. The rack preferably is rectangular and may be made of a variety of chemically resistant materials including polypropylene, polycarbonate, and stainless steel. It comprises a first plurality of parallel vertical walls, and a second plurality of parallel vertical walls perpendicular to the first plurality of walls. These intersecting vertical walls comprise a self-supporting structure without a bottom which sits on four legs. The top surface of the rack is formed by the top edges of all the vertical walls, which are not parallel but are skewed in three dimensions. NASA

N84-20809# Range Commanders Council, White Sands Missile Range, N. Mex. Telemetry Group.
TWELFTH TRANSDUCER WORKSHOP Final Report
LeRoy Bates, ed. and Ken D. Cox, ed. 1983 653 p refs Workshop held in Melbourne, Fla., 7-9 Jun. 1983
(AD-A137304) Avail: NTIS HC A99/MF A01 CSCL 09/1

This document contains papers on the following sessions: Transducer Systems; Temperature, Displacement and Velocity; Pressure; Manufacturers' Panel; and Vibration and Shock. For individual titles, see N84-20810 through N84-20829.

N84-20810# Stein Engineering Services, Inc., Phoenix, Ariz.
MEASUREMENTS ON AND WITH NON-LINEAR SYSTEMS: PROBLEMS AND APPROACHES
Peter K. Stein *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 2-35 refs (For primary document see N84-20809 11-35)
(AD-P002673) Avail: NTIS HC A99/MF A01 CSCL 09/1

Whenever the relationship between two qualities is anything other than a straight line, time variations of one quality at one set of frequencies will result in variations of the other quantity at a different set of frequencies. Non-linear systems are frequency-creative. This is an inherent property of non-linear systems, and can, in fact, be used as a check on system linearity. This property of linear systems may be desired when new frequencies are to be created, such as in frequency multiplication, division or in modulators of all kinds. This property is undesired and can create havoc in those measuring systems in which any of the following criteria are to be met: (1) Frequency-content reproduction or spectral-content reproduction, for subsequent analysis as signatures, thumbprints, patterns, etc.; (2) Wave-shape reproduction with subsequent analysis of patterns; (3) Peak-to-peak reproduction of wave shapes, as in calibration signals with square waves of injected resistance changes (shunt calibration); (4) Integration of signals; and (5) Differentiation of signals. Author (GRA)

N84-20811# Sandia Labs., Albuquerque, N. Mex.
DRIFT PREDICTION FOR A ROLL-STABILIZED INERTIAL MEASUREMENT SYSTEM
V. I. Bateman *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 36-62 refs Previously announced as N83-36053 (For primary document see N84-20809 11-35)
(AD-P002674; DE83-012635; SAND-82-1877C; CONF-830639-4) Avail: NTIS HC A99/MF A01 CSCL 09/1

This paper describes a roll-stabilized inertial measurement system which will measure three orthogonal body angular rates and three orthogonal body accelerations and will calculate three Euler angles for attitude control of small rocket systems and/or large rocket payloads in flight. An analysis of the predicted drift in the Euler angles has been undertaken to aid in the definition of computational hardware characteristics (such as gyro resolution and gyro sample frequency) and to assess the performance of the system over typical trajectories. GRA

N84-20812# Wilcoxon Research, Rockville, Md.
PERFORMANCE EVALUATION OF SENSORS
Paul S. Lederer *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 63-79 refs (For primary document see N84-20809 11-35)
(AD-P002675) Avail: NTIS HC A99/MF A01 CSCL 09/3

This paper discusses the basic principles of sensor performance evaluation necessary to assure meaningful measurements with the sensor. The subject is divided into the four major areas of: static calibration, dynamic calibration, investigation of environmental effects, and investigation of durability. Each of the areas is discussed in sufficient detail to be of benefit to the measurement engineer. A selected bibliography is included. Author (GRA)

N84-20813# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
TEST AND EVALUATION OF RADIOACTIVELY CONTAMINATED TRANSDUCERS AND TRANSMITTERS
Rolf C. Strahm *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 80-98 ref (For primary document see N84-20809 11-35)
(Contract DE-AC07-76ID-01570)
(AD-P002676) Avail: NTIS HC A99/MF A01 CSCL 18/8

People in the nuclear industries face some unique problems when handling, testing, or examining transducers and transmitters that have been radioactively contaminated. Although many people and organizations, have performed such work for many years there are no set structures, approaches or procedures. This paper discusses a disciplined laboratory approach to contaminated transducer testing and evaluation, utilizing equipment and facilities developed specifically for this type of work. Author (GRA)

N84-20814# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
NON-SELF GENERATING TRANSDUCER SIGNAL CONDITIONING TECHNIQUE
Richard Talmadge *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 99-113 refs (For primary document see N84-20809 11-35)
(AD-P002677) Avail: NTIS HC A99/MF A01 CSCL 09/1

This paper presents an approach to signal conditioning of resistance type transducers that provides improved accuracy under adverse conditions encountered in airborne and field testing as well as simplified calibration requirements. The technique involves using a dual tracking constant current circuit to supply the bridge power and measuring the differential IR drops across the elements. The bridge in this case, is really a Y circuit composed of two series branches with a common node. In this configuration the two current sources are connected to the tips of the Y and the IR drops between the supplies and the supply common are measured. The common node is connected to the power supply common. The change in IR drop (delta R) is a linear representation of the physical phenomenon at the transducer plus the lead wire effects, and since the circuit is symmetrical in every respect it

requires only three wires to implement any conventional bridge circuit with complete lead wire effect cancellation. Author (GRA)

N84-20815# California Univ., Livermore. Lawrence Livermore Lab. Measurement System Engineering Section.
A HIGH ACCURACY TEMPERATURE MEASUREMENT ON A DIAGNOSTIC CANISTER FOR THE NEVADA TEST SITE
Donald C. Gerigk *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 130-142 (For primary document see N84-20809 11-35)
(AD-P002678) Avail: NTIS HC A99/MF A01 CSCL 14/2

A data system was designed to measure 30 temperatures to an overall accuracy of + or - 0.1 C. The temperature measurements were part of a dimensional ability study being done on a diagnostic canister used at the Nevada Test Site by the Lawrence Livermore National Laboratory. The system consisted of thermistors as the temperature-sensing element and a data logger which provided the following functions: current source, scanning system, voltmeter, and clock. A microprocessor, in turn, provided control to the data logger, a storage medium for the data, and the means for on-line conversion and display of the data. The performance of the system was optimized by calibrating each thermistor channel using the data system as readout and creating a unique calibration equation for each thermistor. Thus the system was calibrated as a whole to eliminate as many variables as possible. Four separate calibration runs were made. The data from one of these runs were used to calculate the constants for the temperature versus resistance equation for each thermistor channel. The data from the remaining three runs were then compared to resistance points calculated using this equation. The maximum deviation for any thermistor channel was 0.03 C. The system performed very well, recording data every hour for approximately three weeks.
Author (GRA)

N84-20816# Bently Nevada Corp., Minden.
A NEW APPLICATION OF PROXIMITY PROBE MEASUREMENT ON ROLLING ELEMENT BEARINGS
Tom McGauvran *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 143-150 refs (For primary document see N84-20809 11-35)
(AD-P002679) Avail: NTIS HC A99/MF A01 CSCL 14/2

Flaw detection in rolling element bearings has long presented a difficult challenge to accomplished machinery exports. Due in large part to the complexity of the overall vibration signature, flaw detection has focused on an examination of individual frequency components. The primary instrument for this analysis has been the real time spectrum analyzer. Author (GRA)

N84-20817# Rocketdyne, Canoga Park, Calif.
SPACE SHUTTLE MAIN ENGINE TURBOPUMP TRANSDUCER
Tom Peterson *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 151-172 (For primary document see N84-20809 11-35)
(AD-P002680) Avail: NTIS HC A99/MF A01 CSCL 13/11

Advances in liquid rocket engine technology were required to meet the life and reuseability criteria set by the Space Shuttle Program for the Space Shuttle Main Engines (SSME). To verify the SSME design life, extensive development testing and hardware inspection was required. Each SSME has four turbopumps which are used to pump propellant for combustion. One of these turbopumps which pumps liquid oxygen is the High Pressure Oxygen Turbopump (HPPTP). Using a two stage turbine, the HPCTP produces 29,410 horsepower to pump 69.6 pounds per second of liquid oxygen. One area of hardware inspection and testing to insure engine life and operation was in the area of the rocket engine turbopumps bearings. Bearing life is critical to the overall reusability of the HPOTP. After each development test of the SSME, inspection of many engine parts are made. During inspection of the HPOTP it was observed that some of the bearings in the pump were wearing excessively. The bearings in question were the number 3 and 4 bearings in the pump. To determine the cause of the wear, one HPOTP would be instrumented to monitor the bearing conditions. Author (GRA)

N84-20818# Naval Air Test Center, Patuxent River, Md.
UTILIZATION OF DOUBLE INTEGRATION METHODOLOGY TO DETERMINE AN AIRCRAFT'S VERTICAL DISPLACEMENT c06
Terry A. Collom *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 173-189 (For primary document see N84-20809 11-35)
(AD-P002681) Avail: NTIS HC A99/MF A01 CSCL 01/4

In an effort to improve the measurement of the vertical displacement of aircraft which are catapulted off aircraft carriers, an accelerometer based system is being developed. Currently, this measurement is mechanized via camera based data which is reduced after shipboard tests. This turns out to be a significant problem in terms of rapid buildup in determining aircraft minimums (minimum airspeeds). The basic approach taken is to double integrate a gyro stabilized vertical accelerometer. The resulting package is then incorporated into the subject aircraft's instrumentation system. The displacement data is telemetered and displayed in real time via a portable ground station located aboard the aircraft carrier. The data signal spectrum has significant components roughly around 1 hertz. To minimize drift problems, an AC type integration is employed. Due to the abnormally low data frequencies and the time constants associated with the electronics, analysis of the signals is difficult and time consuming. Numerous problems exist in the areas of component size, drift, transients, and calibration. This paper will attempt to highlight and solve these problems. Author (GRA)

N84-20819# Nebraska Univ., Lincoln. Dept. of Engineering Mechanics.
AN ANGULAR VELOCIMETER FOR AEROSPACE APPLICATIONS c19
P. W. Whaley *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 190-215 refs (For primary document see N84-20809 11-35)
(AD-P002682) Avail: NTIS HC A99/MF A01 CSCL 14/2

Low level broad band angular vibration measurement applications are continually developing. This has generated a pressing need for a low level angular vibration sensor capable of measuring 0.000001 radians at frequencies from 0 to 10 kHz, with a total size of the sensor on the order of a cubic centimeter. The device described in this paper has potential for satisfying such a need. Only three design parameters are required to address the minimum sensitivity level, and alternate designs with dynamic ranges and durability similar to piezoelectric accelerometers could be developed capable of measuring angles down to 0.000001 radians. Since the device is based on measuring accelerations using piezoelectric crystals, linearity, dynamic range, hysteresis, and stability qualifications, as well as cost of production are anticipated on the order of conventional piezoelectric accelerometers.
Author (GRA)

N84-20820# California Univ., Livermore. Lawrence Livermore Lab.
AN EXTENDED RANGE PENDULOUS VELOCITY GAGE
Laurence Starrh and Roger Noyes (EG&G, Inc.) *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 216-234 (For primary document see N84-20809 11-35)
(AD-P002683) Avail: NTIS HC A99/MF A01 CSCL 14/2

This paper describes the modification of a transducer to extend its dynamic range. These transducers would be used to measure the response of geologic media to stress waves generated during and after underground tests performed by the Lawrence Livermore national Laboratory (LLNL) at the Department of Energy's Nevada Test Site. Included are descriptions of the previously used transducers as well as the modified transducers, their calibration and fielding. The successful extension of range of these transducers will allow the existing measurements system to be a more valuable tool for the LLNL data analysts. The system will be used in the continuing effort to understand geologic phenomena of underground testing. Author (GRA)

N84-20821# Kulite Semi-Conductor Products, Inc., Ridgefield, N.J. Engineering Dept.
TEMPERATURE COMPENSATION AND SHUNT CALIBRATION OF SEMICONDUCTOR PRESSURE TRANSDUCERS
Joseph R. Mallon and Howard Bernstein *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 299-333 refs (For primary document see N84-20809 11-35)
(AD-P002686) Avail: NTIS HC A99/MF A01 CSCL 14/2

Silicon integrated sensor transducers are conventionally temperature compensated by the use of simple passive resistor networks. These networks serve to trim the bridge temperature coefficients to achieve the desired performance. This paper presents several techniques commonly used for this type of transducer. These circuits are presented to allow full understanding by the user of the operation of such transducers and to provide a basis for the thermal compensation of custom flexures and transducer structures employing semiconductor sensors. A novel integrated sensor employing on chip compensation is presented. GRA

N84-20822# Army Research and Technology Labs., Moffett Field, Calif. Aeromechanics Lab.
APPLICATION OF THE SMALL BODY PRESSURE TRANSDUCER
Robert E. George *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 334-359 refs Previously announced as N84-12454 (For primary document see N84-20809 11-35)
(AD-P002687; AD-A131733) Avail: NTIS HC A99/MF A01 CSCL 14/2

Small body pressure transducers were used in both fixed wing and rotary wing scale models to measure dynamic and static pressures. These models were then tested under controlled wind tunnel conditions and the transducer signals recorded for either on or off line analyses. One experiment using the small body pressure transducers was conducted in the American Aeromechanics Wind Tunnel in order to compare different geometrically shaped rotary wing airfoil sections under dynamic stall conditions. An additional application for the small body pressure transducer was a series of tests conducted in both the French Tunnel, Saclay, France, and the Dutch-German Amsterdam, The Netherlands Wind tunnel. During the foreign tests, data obtained on helicopter rotor noise generated by blade pressure disturbances due to helicopter blade vortex interaction. Both the acoustic signature and the blade pressure transducer outputs were recorded simultaneously. In all of these experiments, special purpose electronic and mechanical hardware for the small body pressure transducers was developed. GRA

N84-20823# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF MEASUREMENT SYSTEM PHASE RESPONSE ON SHOCK SPECTRUM COMPUTATION **c39**
Patrick L. Walter *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 360-376 refs (For primary document see N84-20809 11-35)
(AD-P002688) Avail: NTIS HC A99/MF A01 CSCL 20/11

One of the standard methods for characterizing mechanical shock is by means of the shock spectrum. The principal application of the shock spectrum in aerospace technology is to permit component shock test specifications to be generated, independent of specific time histories. Inattention to the dynamics of the instrumentation system used to measure mechanical shock can result in distorted test data. Erroneous component test specifications will orginate from shock spectra calculations based on these distorted data. This documents' premise is that measurement system design is frequently based upon amplitude response considerations with phase response ignored. In structural testing nonlinear phase response in measurement systems results in distorted transient data being recorded for analysis with resultant error in the computed shock spectra. Design guidelines are provided in this work to preclude these errors from occurring. GRA

N84-20824# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Seafloor Geosciences Div.
PIEZOMETER PROBE TECHNOLOGY FOR GEOTECHNICAL INVESTIGATIONS IN COASTAL AND DEEP-OCEAN ENVIRONMENTS
R. H. Bennett, J. T. Burns, J. Lipkin (SNL), and C. M. Percival (SNL) *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 377-404 refs (For primary document see N84-20809 11-35)
(AD-P002689) Avail: NTIS HC A99/MF A01 CSCL 14/2

Three multisensor piezometer probes were developed and field tested for use in coastal (shallow water) fine-grained marine soils. Offshore sites were investigated in the Mississippi Delta. Pore water pressure measurements were determined at several depths below the sea floor using both absolute and differential pressure sensors placed in a four inch diameter probe. Pressure sensors were hard-wired to nearby platforms where signals were conditioned and analog recording devices monitored pore water pressure changes in the marine soils. Pore water pressures were monitored for several months. Two single sensor piezometer probes, light millimeters in diameter, were developed for deep-ocean investigations. These probes use differential pressure sensors and were tested in a hyperbaric chamber pressurized to 55 MPa (8000 psi). Testing was performed for a period of five weeks under high hydrostatic pressure with the probes inserted in reconstituted illitic marine soil. Small differential pore water pressures responded to both mechanically and thermally generated forcing functions. During shallow water investigations and deep-ocean simulated pressure tests, the sensors exhibited excellent sensitivity and stability. These developments in piezometer probe technology provide a means of assessing important geotechnical parameters of fine-grained seabed deposits. GRA

N84-20825# Sandia Labs., Albuquerque, N. Mex. TM Mechanical Design Div.
SYSTEMS APPROACH TO MEASURING SHORT-DURATION ACCELERATION TRANSIENTS
Frederick Schelby *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 476-504 refs Previously announced as N83-34298 (For primary document see N84-20809 11-35)
(AD-P002690; DE83-011499; SAND-82-1730C; CONF-830639-1) Avail: NTIS HC A99/MF A01 CSCL 14/2

It is common for failures to occur when attempting to acquire acceleration structural response measurements during crash, impact, and pyrotechnic testing. The structural response of a mechanical system to severe transient loading is commonly measured by accelerometers which are less than ideal. In particular, their amplitude-frequency response has one or more resonant peaks so that the output of the accelerometer may not be an exact replica of the input if the transient input stimulus contains frequencies near these resonant peaks, signal distortion, over-ranging of signal conditioning electronics, or even failure of the sensing element may occur. These and other problems have spurred the development of a new acceleration-measuring system which incorporates the following features; Transduction Element; Connectors; Mounting; Electronics; and Transducer Resonance. GRA

N84-20826# National Bureau of Standards, Washington, D.C.
CALIBRATION OF VIBRATION PICKUPS AT HIGH FREQUENCIES
Beverly F. Payne *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 505-515 refs (For primary document see N84-20809 11-35)
(AD-P002691) Avail: NTIS HC A99/MF A01 CSCL 14/2

Improved design of vibration pickups by several accelerometer manufacturers has results in low-mass or miniature accelerometers with extended frequency response. This paper discusses methods for measuring the frequency response (calibration) of this type of miniature accelerometer. By using a calibration system composed of a Michelson interferometer with a helium-neon laser as a light source, absolute displacement measurements can be obtained over the frequency range of approximately 2 to 30 kHz. Using techniques developed at NBS, measurements can be obtained at amplitudes of 121 nm and 193 nm. Since the vibration exciters have limitations

in amplitude, the 121-nm technique enables higher frequency measurement capability. These measurement techniques and the experimental measurement apparatus are discussed in this paper. An example of a measurement on a miniature accelerometer over the frequency range of 10 Hz to 30 Hz is discussed. GRA

N84-20827# Systems Science and Software, La Jolla, Calif.
SHOCK ISOLATED ACCELEROMETER
Mark Groethe and Ed Day *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 516-533 (For primary document see N84-20809 11-35)
(Contract DNA001-82-C-0271)
(AD-P002692; SSS-IR-83-6141) Avail: NTIS HC A99/MF A01 CSCL 14/2

This paper presents a novel concept for isolating an accelerometer from large, potentially damaging, transient accelerations. It consists of a piston, bore, and a present frictional force between the two. The accelerometer is mounted on the piston. The piston will displace relative to the bore when the input force to the bore is equal to or greater than the frictional force. By knowing the total piston mass and frictional force between it and the bore, an upper limit to the transmitted acceleration is defined. This clipping acceleration level can then be set to protect the transducer from overranging. Initial tests have successfully clipped 80kg, 70 micron sec duration, input accelerations down to an average level of 20kg. It is shown that once the piston stops sliding within the bore, the integrated accelerometer signal will give the true velocity of the gauge package, and the doubly integrated accelerometer signal will give the true displacement minus the relative displacement between the piston and bore. Methods of controlling the accelerometer and gauge package resonances, excited through shock input, are being developed. Author (GRA)

N84-20828# Endevco, San Juan Capistrano, Calif.
TESTING TECHNIQUES INVOLVED WITH THE DEVELOPMENT OF HIGH SHOCK ACCELERATION SENSORS
Robert D. Sill *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 534-551 refs (For primary document see N84-20809 11-35)
(AD-P002693) Avail: NTIS HC A99/MF A01 CSCL 14/2

This paper describes testing techniques and equipment used in the development of Endevco Model 7270 Shock Accelerometer, having a range beyond 100,000 g and a mounted resonant frequency on the order of a megahertz. Conventional testing techniques proved inadequate for thorough evaluation. A new calibration system based on the Hopkinson bar has been developed to give rigorous and accurate tests to determine sensitivity, amplitude linearity and zero shift due to accelerations beyond the transducer's designed full scale acceleration level. A related but smaller apparatus was developed to determine resonant frequency and also, although to a very rough degree, the frequency response of the accelerometer. It provided the means to create sub-microsecond rise time strain waves to excite an accelerometer's resonant frequency. GRA

N84-20829# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Flight Dynamics Lab.
AIRCRAFT GROUND VIBRATION TEST INSTRUMENTATION SYSTEM
Richard Talmadge and David Banaszak *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 552-579 refs (For primary document see N84-20809 11-35)
(AD-P002694) Avail: NTIS HC A99/MF A01 CSCL 14/2

The Structural Vibration Branch (FIBG) of the Air Force Wright Aeronautical Laboratories is conducting an in-house Ground Vibration Test (GVT) on a full scale F-16 aircraft located inside FIBG's Vibration Aeroelastic facility at Wright-Patterson AFB OH. To measure 120 accelerometer signals simultaneously as required by the GVT, FIBG has designed and fabricated in-house a complete data acquisition system to measure and condition all the required transducer signals. This paper describes the design, configuration, evaluation and calibration of the GVT instrumentation system. Author

N84-20830# Virginia Polytechnic Inst. and State Univ., Blacksburg. Human Factors Lab.
QUALITY METRICS OF DIGITALLY DERIVED IMAGERY AND THEIR RELATION TO INTERPRETER PERFORMANCE: 8 Interim Report, 1 Aug. 1978 - 30 Jun. 1983
Harry L. Snyder 30 Jun. 1983 94 p
(Contract F49620-78-C-0055; AF Proj. 2313)
(AD-A137726; VPI-HFL-83-1; AFOSR-84-0055TR) Avail: NTIS HC A05/MF A01 CSCL 14/5

This report summarizes a five-year research program on the subject of quality evaluation of digitally derived imagery. High-resolution aerial photography was used to create digitized images with unclassified content comparable to that employed in military photointerpretation operations. The digitized imagery was used in several hard-copy and soft-copy interpretation experiments to assess the affects of image blur and noise on both perceived image quality and the ability to extract information from the images. The soft-copy experiments included both nonprocessed and processed imagery. Finally, quality metrics of image quality were obtained for both hard-copy and soft-copy images and related directly to both information extraction performance and subjective quality scaling. GRA

N84-20831# Defence Research Establishment, Ottawa. (Ontario). Energy Conversion Div.
CALIBRATION OF ENGINES LABORATORY AIR FLOW MEASURING DEVICES
S. J. Chiappetta Dec. 1983 38 p
(AD-A137909; DREO-TN-83-35) Avail: NTIS HC A03/MF A01 CSCL 14/2

This note documents the calibration of the two air flow measuring instruments used in the DREO engines laboratory. It was found that the calibration performed agrees closely with the manufacturer's calibration. Functional relationships to acquire air flow from each instrument's output are suggested for use in computer programs. Author (GRA)

N84-20832# Naval Research Lab., Washington, D. C. Plasma Physics Div.
A BEAM CURRENT DENSITY MONITOR FOR INTENSE ELECTRON BEAMS Interim Report
Ralph B. Fiorito (Naval Surface Weapons Center), Michael Raleigh, and Stephen M. Seltzer (NBS) 28 Dec. 1983 21 p
(Contract N60921-83-WR-W0114; RR0-1109-41; ARPA Order 4395)
(AD-A137146; NRL-MR-5241) Avail: NTIS HC A02/MF A01 CSCL 14/2

The authors describe a new type of electric probe for mapping the radial current density profile of high-energy, high current electron beams. The idea of developing an electrically sensitive probe for these conditions was originally suggested to one of the authors during a year's visit to the Lawrence Livermore National Laboratory. The resulting probe is intended for use on the Experimental Test Accelerator (ETA) and the Advanced Test Accelerator at that laboratory. This report discusses in detail: the mechanical design, the electrical response, and temperature effects, as they pertain to the electric probe, and describe the first experimental results obtained using this probe on ETA. GRA

N84-20833# Lincoln Lab., Mass. Inst. of Tech., Lexington. Electronic Systems Div.
A CCD PHOTOMETRIC CAMERA FOR SATELLITE OBSERVATION
G. J. Mayer, M. J. MacDonald, and N. G. S. Pong 29 Nov. 1983 31 p
(Contract F19628-80-C-0002; AF Proj. 2698; AF Proj. 2295)
(AD-A137214; ETS-72; ESD-TR-83-107) Avail: NTIS HC A03/MF A01 CSCL 03/2

A CCD camera for photometric measurement of satellites has been built, tested, and has been integrated into the Experimental Test System (ETS). This report describes the camera, the computer system and programs used to collect data, the camera's sensitivity parameters, the sensitivity of the camera on the ETS 31-inch

Telescope, and its projected sensitivity on Ground-Based Electro-Optical Deep Space Surveillance System (GEODSS) main telescope. GRA

N84-20634# Bendix Corp., Kansas City, Mo.
MEASUREMENT CAPABILITIES OF THE BENDIX METROLOGY ORGANIZATION
L. M. Barnes Jan. 1984 68 p
(Contract DE-AC04-76DP-00613)
(DE84-005876; BDX-613-3024) Avail: NTIS HC A03/MF A01

The measurement and calibration capabilities of the metrology organization of the Bendix Kansas City Division are presented. A listing of the measurement types and ranges available, and the accuracies normally attainable under conditions at the Kansas City Division is included. Currently used standards and measurement devices are described. The manual is divided into four major sections, each describing a broad general area of measurement: (1) mechanical; (2) environmental, gas, liquid; (3) electrical; and (4) optical and radiation. DOE

N84-20635# Smithsonian Astrophysical Observatory, Cambridge, Mass.
DEVELOPMENT OF A HIGH RESOLUTION CYLINDRICAL CRYSTAL SPECTROMETER FOR LINE SHAPE AND SPECTRAL DIAGNOSTICS OF X-RAYS EMITTED FROM-HOT-PLASMAS Final Report, 1 Jun. 1976 - 31 Dec. 1983
Elizabeth Kaelne Jan. 1984 74 p
(Contract DE-AC02-76ET-53052)
(DE84-005664; DOE/ET-53052/T1) Avail: NTIS HC A04/MF A01

The development, installation and evaluation of a high resolution X-ray spectroscopic diagnostics is reported. The approach was to optimize spectrometer throughput to enable single shot plasma diagnostics with good time resolution and to ensure sufficient energy resolution to allow line profile analysis. These goals were achieved using a new X-ray geometry combined with a new position sensitive X-ray detector. These diagnostics were used to detect X-ray emission of highly ionized impurity elements as well as argon seed elements specially introduced into the plasma for this diagnostic. Temporally resolved ion temperature profiles were obtained from the recorded X-ray spectra simultaneously with other plasma parameters such as electron temperature, ionization temperature and ionization stage distribution. Radial profiles were also measured. The developed X-ray diagnostics serve as a major multiparameter probe of the central core of the plasma with complementary information on radial profiles. DOE

N84-20636# Sandia Labs., Albuquerque, N. Mex. Test Planning and Diagnostic Div.
ANALYSIS OF A TIME-OF-FLIGHT NEUTRON SPECTROMETER
Frank Biggs Dec. 1983 9 p refs
(Contract DE-AC04-76DP-00789)
(DE84-006504; SAND-83-2218) Avail: NTIS HC A02/MF A01

A neutron spectrometer was analyzed. The spectrum is resolved using a time of flight method in which the angular position of a rapidly spinning wheel is used to measure time. The measurement method is summarized, the data analysis problem is formulated, units are discussed, the calibration technique is described, and a spectral transformation is developed. DOE

N84-20637# California Univ., Livermore. Lawrence Livermore Lab.
PRETREATMENT OF KAPTON-COATED CABLE FOR EPOXY ADHESION
James F. Carley 9 Jan. 1984 11 p refs
(Contract W-7405-eng-48)
(DE84-006265; UCID-19984) Avail: NTIS HC A02/MF A01

A new system to protect bonded strain gages that will be attached to the MFTF magnets was tested and indicated falling electrical resistance to ground, which is attributed to the infiltration of moisture. The most likely infiltration route seemed to be along the Kapton lead cable, which has an outer space of FEP fluorocarbon resin. The treated ends are embedded in the epoxy sealant, Hysol EA 934, a compound containing 70 wt % of asbestos. The tensile shear stresses required to pull the wires out of these embedments were measured. It is shown that the three levels of treatment are equally effective in raising the bond strength from 377 psi for the untreated cable to about twice that, 763 psi. It appears that the 40-s exposure to Tetra-Etch has penetrated the 0.5 mil fluorocarbon coating and attacks the Kapton film and the conductor coatings inside it. DOE

N84-20638# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
INSTRUMENT FAILURE DETECTION IN NONLINEAR SYSTEMS
J. Louis Tylee and John E. Purviance (Idaho Univ., Moscow) 1983 12 p refs Presented at the 22nd IEEE Conf. on Decision Control, San Antonio, 14-16 Dec. 1983
(Contract DE-AC07-76ID-01570)
(DE84-005306; EGG-M-05183; CONF-831235-3) Avail: NTIS HC A02/MF A01

A simple approach to detecting instrument failures in dynamic systems described by nonlinear continuous differential equations is presented and evaluated. The method uses an extended Kalman filter to generate an innovations (or residuals) vector. Threshold crossing checks on the mean and variance of elements in this vector are used to ascertain existence of failure. The approach is demonstrated using data from a nuclear reactor. DOE

N84-20639# Michigan Univ., Ann Arbor. Space Physics Research Lab.
CHEMILUMINESCENT/LASER DIODE MEASUREMENT TECHNIQUE INTERCOMPARISON AND CAPTIVE AIR MEASUREMENT PROGRAM Final Report
James G. Walega, Donald H. Stedman, Richard E. Shetter, Robert S. Fukuda, and Thomas A. Bahls Aug. 1983 250 p refs
(PB84-134485; CRC-APRAC/CAPA-17/19-80) Avail: NTIS HC A11/MF A01 CSCL 14B

The objectives of this program were to carry out intercomparisons of the two techniques under varied conditions to ensure reliability of the analytical systems, and to obtain a high quality captive air NO/NO2/HNO3 data set. Field intercomparison showed that problems which had arisen during the laboratory intercomparison studies had been resolved, and demonstrated good agreement between chemiluminescence and laser diode techniques for all species at realistic ambient concentrations. The captive air studies showed good agreement for all species except for the anticipated PAN interference in the UM NO2 measurement, and the ambient air studies showed similarly good agreement except that the chemiluminescent technique gave erratic HNO3 readings in the presence of the local large fluctuating NO and NO2 concentrations. Author (GRA)

N84-20640# Lister Hill National Center for Biomedical Communications, Bethesda, Md.
VIDEODISC PREMASTERING FACILITY: TECHNICAL EVALUATION Report, 1982 - 1983
George Thoma, Richard Grier, Suzanne Merriam, and William Leonard Sep. 1983 153 p refs
(PB84-135821; LHNCBC/TR-83-10) Avail: NTIS HC A08/MF A01 CSCL 14B

It is widely recognized that the videodisc has the potential to improve productivity in areas such as information transfer and education. Apart from simply serving as a linear playback medium for home entertainment, the videodisc is finding applications as an interactive medium for information, instruction, and as a visual database. This report describes a facility developed to perform the premastering functions for a Level Two disc, the results of a technical evaluation of this facility, and the level-of-effort and costs associated with the development of the experimental interactive videodisc. Author (GRA)

N84-20528*# Spectron Development Labs., Inc., Costa Mesa, Calif.

DEVELOPMENT AND IMPLEMENTATION OF ADVANCED DIAGNOSTIC TECHNIQUES
Cecil F. Hess *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 23-29 (For primary document see N84-20525 11-07)
(Contract NAS3-23538)
Avail: NTIS HC A14/MF A01 CSCL 14B

36 LASERS AND MASERS

Includes parametric amplifiers.

N84-20841*# Phoenix Corp., McLean, Va.
DETAILED DESIGN OF A VARIABLE VOLUME HYDROGEN MASER
Peter O. Cervenka 17 Jan. 1977 31 p refs
(Contract NAS5-23864)
(NASA-CR-175221; NAS 1.26:175221) Avail: NTIS HC A03/MF A01 CSCL 20E

Identification of the hydrogen maser design parameters include the shape of the bulk, q (quality parameter), tuning factors, materials to be used, and operational temperature to offset the wall shift. Expressions for the statistic error on the measured frequency were derived. Localized variations in the concentration of excited atoms were studied and how the shape of the container (the ratio of surface to volume in particular) affects their behavior. B.G.

N84-20842*# Illinois Univ., Urbana. Radio Research Lab.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF LASER ALTIMETERS FOR BAROMETRIC MEASUREMENTS OVER THE OCEAN
B. M. Tsai and C. S. Gardner Mar. 1984 215 p refs
(Grant NsG-5049)
(NASA-CR-175443; NAS 1.26:175443; RRL-Publ-527) Avail: NTIS HC A10/MF A01 CSCL 20E

The statistical characteristics and the waveforms of ocean-reflected laser pulses are studied. The received signal is found to be corrupted by shot noise and time-resolved speckle. The statistics of time-resolved speckle and its effects on the timing accuracy of the receiver are studied in the general context of laser altimetry. For estimating the differential propagation time, various receiver timing algorithms are proposed and their performances evaluated. The results indicate that, with the parameters of a realistic altimeter, a pressure measurement accuracy of a few millibars is feasible. The data obtained from the first airborne two-color laser altimeter experiment are processed and analyzed. The results are used to verify the pressure measurement concept. A.R.H.

N84-20843*# Ford Motor Co., Dearborn, Mich.
COMMENTS ON LASER-EXCITED FLUORESCENCE OF THE HYDROXYL RADICAL: RELAXATION COEFFICIENTS AT ATMOSPHERIC PRESSURE, APPENDIX 5
Charles C. Wang [1983] 6 p refs Sponsored by NASA
(NASA-CR-175442; NAS 1.26:175442) Avail: NTIS HC A02/MF A01 CSCL 20E

The lifetime of the excited state of a atom or molecule is often determined from the rate of fluorescence decay originating as a function of buffer gas pressure, an accurate determination is made of the rates of collision induced transitions away from the excited state. Deconvolution can in principle be employed to resolve fluorescence times shorter than the response times of the system. However, attainable reproducibility and accuracy in actual experiments usually set a limit beyond which no meaningful results are expected. Prudence thus dictates that the results of deconvolution be viewed with extreme caution whenever fluorescence time much shorter than the response of times of the system are indicated.
Author

N84-20844*# Oakland Univ., Rochester, Mich. Dept. of Physics.
SHOT NOISE LIMITED DETECTION OF OH USING THE TECHNIQUE OF LASER INDUCED FLUORESCENCE
Donovan M. Bakalyar, L. I. Davis, Jr., Chuan Guo, John V. James, Spiros Kakos, Peter T. Morris, and Charles C. Wang [1984] 30 p refs Sponsored by NASA and DOE Prepared in cooperation with Wayne State Univ., Detroit and Ford Motor Co., Dearborn, Mich.
(NASA-CR-175433; NAS 1.26:175433) Avail: NTIS HC A03/MF A01 CSCL 20E

Nearly shot-noise limited detection of OH using the technique of laser-induced fluorescence is reported. A LIDAR configuration is used to excite fluorescence in a large volume and a narrow-bandwidth interference filter provides spectral discrimination. This arrangement alleviates the effect of ozone interference and facilitates image processing at relatively close distances. The detection limit is determined mainly by the shot-noise of the solar background. Ground-based measurements in Dearborn indicate a detection limit of better than 1 x 10 to the 6th power OH/cubic cm over a forty-minute acquisition period. Under favorable conditions, a comparable detection limit was also observed for airborne measurements. Author

N84-20845# Massachusetts Inst. of Tech., Cambridge. Crystal Physics and Optical Electronics Lab.
SPECTROSCOPIC EVALUATION OF Nd(3+):CAMGAR AND H SUB O(3+):YLF AS 0.94 MICROMETER LASERS Final Report
A. Linz and H. P. Jenssen 12 Dec. 1983 104 p
(Contract N00014-78-C-0133)
(AD-A137610; OSP86111) Avail: NTIS HC A06/MF A01 CSCL 20/5

An efficient laser operating near the 0.94 micrometer wavelength is of interest because with frequency doubling one can have a 470 nm laser with potentially higher overall efficiency than any primary laser at this wavelength. Nd(3+) in most oxide garnet host crystals has a 0.94 micrometer transition. What is required for 0.94 micrometer transition and a large branching ratio of 0.94 micrometer emission relative to the 1.06 emission. Detailed spectroscopy was performed on Nd:CAMGAR in order to determine the relevant cross sections. The results show that the 1.06 micrometer cross section in CAMGAR is about 0.25 of the 1.06 micrometer cross section in YAG whereas the ratio of the 0.94 micrometer cross sections is 0.5. Laser experiments on both Nd:YAG and Nd:CAMGAR by longitudinal pumping with an Ar laser substantially verified the relative cross sections of the two materials. The 0.94 micrometers results were limited, however, and the resulting cross section for Nd:CAMGAR is higher than the spectroscopically determined value. HO(3+) is an alternate ion for a 0.94 micrometer laser. The Ho 5F5 level to 5I7 level has been reported lased at 0.98 epsilon micrometer both in 2% in LiYF4 and in LiHoF4. An analysis of Ho:YLF has been done to evaluate its potential as a useful laser material. GRA

N84-20846# Stanford Univ., Calif.
TRANSVERSE MODE DYNAMICS IN A FREE ELECTRON LASER Interim Report
Pascal Elleaume and David A. G. Deacon Aug. 1983 32 p
(Contract F49620-80-C-0068; AF Proj. 2301)
(AD-A137738; AFOSR-84-0097TR) Avail: NTIS HC A03/MF A01 CSCL 20/5

The most general equations of motion for the electrons and the electromagnetic field in a free electron laser including the effects of diffraction and pulse propagation. The field evolution is expressed in terms of the amplitudes and phases of a complete set of transverse modes is derived. The analytic solution is given in the small signal regime, where the theory is shown to be in excellent agreement with a recent experiment at Orsay. GRA

N84-20847# Stanford Univ., Calif. Physics Labs.
EXPERIMENTAL INVESTIGATION OF THE CHARACTERISTICS OF AN ULTRAVIOLET STORAGE RING LASER Final Technical Report, 1 Jun. 1982 - 31 Mar. 1983
John M. J. Madey 31 Mar. 1983 15 p
(Contract F49620-80-C-0068; AF Proj. 2301)
(AD-A137751; AFOSR-84-0094TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Experimental hardware and instrumentation were installed and used to study laser-induced bunch lengthening, gain, diffraction effects, and subthreshold behavior in a ACO storage ring free electron laser. Electron beam heating and laser damage are discussed. A.R.H.

N84-20848# Paris-Sud Univ., Orsay (France). Lab. de Photophysique Moleculaire.
NEW RESULTS OF THE ACO STORAGE RING FREE ELECTRON LASER Interim Report
M. Velghe, M. Bergher, C. Bazin, M. Billardon, D. A. G. Deacon (Deacon Research), P. Elleaume (Service de Photophysique), J. M. J. Madey (Stanford Univ.), J. M. Ortega (Ecole Superieure de Physique et Chimie), Y. Petroff, K. E. Robinson (Stanford Univ.) et al Apr. 1983 9 p Presented at the Intern. Conf., Lasers '82, New Orleans, 13-17 Dec. 1982 Submitted for publication
(Contract F49620-80-C-0068; AF Proj. 2301)
(AD-A137785; HEPL-925; AFOSR-84-0096TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

To improve the gain in the Orsay storage ring free electron laser experiment, the seventeen periods permanent magnet undulator was modified into an optical klystron. The author reports the laser induced bunch lengthening and the gain measurement on the optical klystron and compare these to the undulator case. Author (GRA)

N84-20849# Stanford Univ., Calif.
EVOLUTION OF THE TRANSVERSE MODES IN A FEL (FREE ELECTRON LASERS), AND APPLICATION TO THE ORSAY EXPERIMENT Interim Report
P. Elleaume and D. A. G. Deacon Aug. 1983 8 p
(Contract F49620-80-C-0068; AF Proj. 2301)
(AD-A137797; AFOSR-84-0099TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors derive the most general equations of motion for the electrons and the electromagnetic field including the effects of diffraction and pulse propagation. The field evolution is expressed in terms of the amplitudes and phases of a complete set of transverse modes. The analytic solution is given in the small signal regime, where the theory is shown to be in excellent agreement with a recent experiment. Author (GRA)

N84-20850# University of Southern California, Los Angeles. Center for Laser Studies.
LASER CHEMICAL VAPOR DEPOSITION Final Scientific Report
S. D. Allen and M. Bass 20 Dec. 1983 84 p
(Grant AF-AFOSR-0135-79; AF Proj. 2301)
(AD-A137827; AFOSR-84-0052TR) Avail: NTIS HC A05/MF A01 CSCL 20/5

Metal, dielectric and semiconductor films have been deposited by laser chemical vapor deposition (LCVD) using both pulsed and CW laser sources on a variety of substrates. For LCVD on substrates such as quartz, the deposition was monitored optically in both transmission and reflection using a collinear visible laser and the depositing CO2 laser. Deposition initiation and rate were correlated with irradiation conditions, the laser generated surface temperature, and the changing optical properties of the film/substrate during deposition. Single crystallites of W greater than 100 micrometers tall were deposited using a Kr laser on Si substrates. Author (GRA)

N84-20851# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NO. 62, NOVEMBER - DECEMBER 1982
30 Oct. 1983 154 p
(AD-A137854; DIA-DST-2700Z-008-83) Avail: NTIS HC A08/MF A01 CSCL 05/2

This is the Soviet Laser Bibliography for November-December 1982, and is No. 62 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; adaptive optics; computer technology; holography; laser-induced chemical reactions; measurements of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

N84-20852# Defense Intelligence Agency, Washington, D.C. Directorate for Scientific and Technical Intelligence.
BIBLIOGRAPHY OF SOVIET LASER DEVELOPMENTS, NO. 61, SEPTEMBER - OCTOBER 1982
29 Aug. 1983 134 p
(AD-A137867; DIA-DST-2700Z-007-83) Avail: NTIS HC A07/MF A01 CSCL 05/2

This is the Soviet Laser Bibliography for September-October 1982, and is No. 61 in a continuing series on Soviet laser developments. The coverage includes basic research on solid state, liquid, gas, and chemical lasers; components; nonlinear optics; spectroscopy of laser materials; ultrashort pulse generation; theoretical aspects of advanced lasers; and general laser theory. Laser applications are listed under biological effects; communications; beam propagation; computer technology; holography; laser-induced chemical reactions; measurement of laser parameters; laser measurement applications; laser-excited optical effects; laser spectroscopy; beam-target interaction; and plasma generation and diagnostics. Author (GRA)

N84-20853# Duke Univ., Durham, N. C. Dept. of Physics.
MILLIMETER AND SUBMILLIMETER WAVE RESEARCH: SPECTROSCOPY, ENERGY TRANSFER AND TECHNIQUES Final Report, 5 Nov. 1979 - 5 Nov. 1983
Frank C. DeLucia 16 Jan. 1984 35 p
(Contract DAAG29-80-C-0026)
(AD-A137884; ARO-16873.5-PH) Avail: NTIS HC A03/MF A01 CSCL 20/5

The project, 'Millimeter and Submillimeter Wave Research: Spectroscopy, Energy Transfer, and Techniques,' addresses a broad range of scientific topics and technological developments important to this spectral region. For purposes of discussion, this report has been divided into three categories: (1) the development and evolution of techniques for this spectral region, (2) studies of molecular lasers and processes, and (3) the study of energy levels and transition frequencies in molecules. Also included are lists of publications and of personnel who worked on these projects. GRA

N84-20854# California Univ., Los Angeles. Dept. of Electrical Engineering.
SURFATRON LASER-PLASMA ACCELERATOR: PROSPECTS AND LIMITATIONS
C. Joshi 1983 15 p refs Presented at the Spring Coll. on Radiation in Plasmas, Trieste (Italy), 24 May 1983
(Contract DE-AS08-81DP-40163; Grant NSF ECS-80-03558)
(DE84-005497; CONF-8305127-4) Avail: NTIS HC A02/MF A01

The surfatron laser plasma accelerator which is an extension of the plasma heat wave accelerator scheme is discussed. It utilizes very intense electric fields, 10(9) to 10(1)0 V/cm, associated with focussed laser beams to accelerate particles. DOE

N84-20855# California Univ., Livermore. Lawrence Livermore Lab.
MECHANICAL CONSTRUCTION OF THE 22 NOVA LASER
C. A. Hurley, F. A. Frick, H. G. Patton, G. Bradley, and A. Martos 22 Nov. 1983 29 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-48)
(DE84-005432; UCRL-89192; CONF-831203-86) Avail: NTIS HC A03/MF A01

The largest precision opto-mechanical system ever built, the Nova laser system was designed for interial confinement fusion. The construction of the system is described including the clean

rooms, the mirror, amplifiers, spatial filters, Faraday rotators, and the support. A.R.H.

N84-20856# Los Alamos Scientific Lab., N. Mex.
FIRST OPERATION OF THE LOS ANGELES FREE-ELECTRON LASER OSCILLATOR
R. W. Warren, B. E. Newman, W. E. Stein, J. G. Winston, R. L. Sheffield, M. T. Lynch, J. C. Goldstein, M. C. Whitehead, O. R. Norris, G. Luedemann et al 1983 8 p refs Presented at the 6th Intern. Conf. on Lasers and Appl., San Francisco, 12-16 Dec. 1983
(Contract W-7405-eng-36)
(DE84-006024; LA-UR-84-202; CONF-831265-1) Avail: NTIS HC A02/MF A01

An FEL oscillator has been operated at wavelengths between 9 and 11 (MU)m with a peak intracavity power of about 20 MW and an average output power of 1 kW in 70- (MU)s pulses. The design parameters and operating characteristics are presented. Measurements of spontaneous emission, start-up of oscillations, and signal growth through approx. 9 orders of magnitude to saturation are also presented. The dependence of gain and saturation on cavity length, alignment, beam parameters, and other critical variables are discussed and compared with theory. DOE

N84-20529*# Aerometrics, Inc., Mountain View, Calif.
ANALYSIS AND TESTING OF A NEW METHOD FOR DROP SIZE AND VELOCITY MEASUREMENTS USING LASER LIGHT SCATTER INTERFEROMETRY
W. D. Bachalo *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 31-45 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20E

N84-20551*# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
SATURATED LASER FLUORESCENCE IN TURBULENT SOOTING FLAMES AT HIGH PRESSURE
Galen B. King, Campbell D. Carter, and Normand M. Laurendeau *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 237-242 (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N84-20857*# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.
FEASIBILITY OF REMOTELY MANIPULATED WELDING IN SPACE. A STEP IN THE DEVELOPMENT OF NOVEL JOINING TECHNOLOGIES Final Report
Koichi Masubuchi, John E. Agapakis, Andrew DeBiccari, and Christopher vonAlt Sep. 1983 260 p refs
(Contract NASw-3740)
(NASA-CR-175437; NAS 1.26:175437) Avail: NTIS HC A12/MF A01 CSCL 13I

In order to establish permanent human presence in space technologies of constructing and repairing space stations and other space structures must be developed. Most construction jobs are performed on earth and the fabricated modules will then be delivered to space by the Space Shuttle. Only limited final assembly jobs, which are primarily mechanical fastening, will be performed on site in space. Such fabrication plans, however, limit the designs of these structures, because each module must fit inside the transport vehicle and must withstand launching stresses which are considerably high. Large-scale utilization of space necessitates more extensive construction work on site. Furthermore, continuous operations of space stations and other structures require maintenance and repairs of structural components as well as of tools and equipment on these space structures. Metal joining technologies, and especially high-quality welding, in space need developing. Author

N84-20858*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTIONAL AND MORPHOLOGICAL PROPERTIES OF Au-MoS2 FILMS SPUTTERED FROM A COMPACT TARGET
Talivaldis Spalvins 13 Apr. 1984 19 p refs Presented at 11th Intern. Conf. on Metallurg. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by American Vacuum Society
(NASA-TM-83604; E-2004; NAS 1.15:83604) Avail: NTIS HC A02/MF A01 CSCL 11H

AuMoS2 films 0.02 to 1.2 microns thick were sputtered from target compacted from 5 wt % Au + 95 wt % MoS2, to investigate the frictional and morphological film growth characteristics. The gold dispersion effects in MoS2 films are of interest to increase the densitification and strengthening of the film structure. Three microstructural growth stages were identified on the nano-micro-macrostructural level. During sliding both sputtered Au-MoS2 and MoS2 films have a tendency to break within the columner region. The remaining or effective film, about 0.2 microns thick, performs the lubrication. The Au-MoS2 films displayed a lower friction coefficient with a high degree of frictional stability and less wear debris generation as compared to pure MoS2 films. The more favorable frictional characteristics of the Au-MoS2 films are attributed to the effective film thickness and the high density packed columner zone which has a reduced effect on the fragmentation of the tapered crystallites during fracture. M.G.

N84-20859*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
OPTIMIZED BOLTED JOINT Patent Application
Leonard J. Hart-Smith (McDonnell Douglas Corp., Long Beach, Calif.), Bruce L. Bunin (McDonnell Douglas Corp., Long Beach, Calif.), and Donald J. Watts, inventors (to NASA) (McDonnell Douglas Corp., Long Beach, Calif.) Filed 23 Jan. 1984 15 p Sponsored by NASA
(NASA-Case-LAR-13250-1; US-Patent-Appl-SN-573162) Avail: NTIS HC A02/MF A01 CSCL 13I

A method is disclosed for joining segments of the skin of an aircraft. The ends of the skin are positioned in close proximity or abutt each other. The skin is of constant thickness throughout the joint and is sandwiched between splice plates, which taper in thickness from the last to the first bolt rows in order to reduce the stiffness of the splice plate and thereby reduce the load transfer at the location where bypass loads are highest. The last row of bolts are in the thin end of the splice plates, and the first row of bolts are in the thick portion of the splice plate. The thicker portions of the splice plates also overlap the ends of the skin segments. Joint load is maximized by minimizing the bearing area at the splice plate location where the splice plate is thinnest, while maximizing the bypass load in the net skin section at the same location. Simultaneously, the bearing load in both the skin and the splice plate is maximized in the area where the splice plate is thickest. NASA

N84-20860*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SELF-INDEXING LATCH SYSTEM Patent Application
John C. Gibson, John A. Calvert, Malcolm F. Nesmith, and Richard A. Cloyd, inventors (to NASA) Filed 15 Feb. 1984 17 p
(NASA-Case-MFS-25956-1; US-Patent-Appl-SN-580397) Avail: NTIS HC A02/MF A01 CSCL 13I

A self-latching jaw assembly is described which includes a pair of jaws for latching a fitting of an associated structure such as the keel fitting of a space telescope. The jaw assembly automatically locates the fitting received on a positioning pedestal and latches it in its original location on the pedestal without need of precision alignment. The first jaw is actuated and moved to the right whereupon a reciprocating plunger, extended from the nose of the jaw senses the hub of the spool. A jaw position responsive switch is then actuated to terminate the drive motor of the jaw. An astronaut then actuates the drive motor of the jaw and the

jaw moves to the left whereupon standoff engages the face of the jaw in a latching position. In the latching position, the noses of the jaws are under the flanges of the spool. NASA

N84-20861# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
HEAVY MACHINE-TOOL CONSTRUCTION FOR 50 YEARS
V. D. Glukharev and A. V. Sklyarov 17 Jan. 1984 30 p Transl. into ENGLISH from Mekh. i Avtomatizatsiya (USSR), no. 11, 1967 p 5-9
(AD-A137599; FTD-ID(RS)T-1597-83) Avail: NTIS HC A03/MF A01 CSCL 13/9

The history of machine tool construction in Russia is presented. The manufacture of various tools is discussed. S.L.

N84-20862# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical and Aerospace Engineering.
KINEMATIC AND DYNAMIC ANALYSIS OF HIGH-SPEED INTERMITTENT-MOTION MECHANISMS Final Report, period ending 1 Dec. 1980
Ting W. Lee 16 Jan. 1984 77 p
(Contract DAAG29-81-K-0016)
(AD-A137903; ARO-17731.3-EG) Avail: NTIS HC A05/MF A01 CSCL 20/11

This research applies recent advances in kinematics, using fundamental models of dynamics, coupled with experimental observations in order to develop methods capable of predicting the performance as well as motion characteristics of certain basic intermittent-motion mechanisms which are useful in industry and military applications. These methods were applied to a selected group of mechanisms, such as Geneva, ratchets and escapements. The analytical part of this research involves: investigation of the kinematic and dynamic performance characteristics of these selected mechanisms; formulation of a dynamic model of impact; determination of the dynamic response of this model under various operating conditions; and development of unit computational programs for analyzing the kinematic characteristics and dynamic response of these intermittent-motion mechanisms. The experimental part of the research involves measurements of the kinematic and dynamic response, and stresses of high-speed external Geneva mechanisms. The purpose of the measurements is to correlate with analysis and to verify the results of theoretical findings. The theory developed in the high-speed intermittent-motion mechanisms was extended to two related areas of mechanism design problems: the momentary-dwell type of intermittent-motion mechanisms which have potential application to the high-speed automatic weapon system; and an investigation on the workspace of a robotic manipulator system. GRA

N84-20863# SKF Industries, Inc., King of Prussia, Pa.
LUBRICATION OF ENGINEERING SURFACES, PHASE 2 Final Report
John I. McCool Dec. 1983 183 p refs
(Contract DE-AC02-80ER-10693)
(DE84-005685; DOE/ER-10693/T-T1; SKF-AT83D043) Avail: NTIS HC A09/MF A01

The improvement of the state of the art of performance prediction for rolling/sliding contacts in the statistical microgeometry of the contacting bodies and the properties of the fluid medium that separates the surfaces are discussed. The work was divided into several interrelated areas: development of an asperity contact model that accounts for the inherent directionality that typifies real surfaces and that specifically reflects the effect of frequency content of the roughness process; development of guidelines to preprocessing roughness data and to assess the distortional effect of stylus radius and flight, record length, sampling rate and quantization error on the generalized surface characterization required by the contact model; delineate the limitations of the assumptions of mechanical and statistical independence and gaussianity, inherent in asperity contact models and the limitations of modelling asperity shapes as 2nd order polynomials; development and experimental validation of a combined fluid/coulomb model to predict the traction transmitted when real surfaces undergo relative rolling and sliding in the important regime where the lubricant film is thin enough to permit some degree of asperity contact; and generation and compilation of lubricant and surface roughness data required for contact performance prediction and quantification of the statistical error inherent in surface characterizations. DOE

N84-20864# California Univ., Livermore. Lawrence Livermore Lab.
FLYWHEEL ROTOR AND CONTAINMENT TECHNOLOGY DEVELOPMENT Final Report
Peter B. Mohr and Carl E. Walter 19 Sep. 1983 92 p refs
(Contract W-7405-eng-48)
(DE84-005742; UCRL-53448) Avail: NTIS HC A05/MF A01

A program to develop energy storage systems based on high performance flywheels is summarized. Activities of the final year included fabrication, quality assurance inspection, and spin test evaluation of rotor and containment structures. Peak stored energies approaching 0.7 kWh were consistently attained in 1 kg rotors, yielding material average stored energy densities exceeding 70 Wh/kg. Flywheel rotors were tested by cycling them between full design speed and half speed for 10,000 cycles without rotor failure. Production cost were estimated for three flywheel designs. Construction began on a second generation hybrid automobile combining a flywheel, a continuously variable transmission, and a conventional heat engine, a combination which promises fuel economy improvements up to 100% in urban use. Directions for future work when interest in flywheel systems reappears are suggested. DOE

N84-20865# Westinghouse Research and Development Center, Pittsburgh, Pa. Mechanical Products Design Div.
HIGH-EFFICIENCY DUAL-STROKE COMPRESSOR FOR HEAT PUMPS
R. R. Young, S. E. Veyo, and J. C. Kastovich 1984 43 p refs Presented at the Am. Soc. of Heating, Refrig. and Air-Conditioning Engr. Meeting, Atlanta, 28 Jan. - 1 Feb. 1984
(Contract W-7405-eng-26)
(DE84-005813; CONF-840124-2) Avail: NTIS HC A03/MF A01

The development of a high efficiency, two capacity, three cylinder, reciprocating piston, hermetic compressor for the advanced electric heat pump is described. The patented capacity modulation concept employs an eccentrically bored circular cylinder cam between crankpin and connecting rod which acts to change the stroke of the compressor upon a change in the direction of rotation of the crankshaft. Complementary design features that result in high efficiency include a circulating oil system that cools the drive motor and the compressor and rejects heat external to the compressor shell, a suction piping system that routes gas into the cylinders in a manner to impede heat transfer, a discharge piping scheme that impedes heat transfer and reduces pressure loss, an improved valve and valve plate system that reduces flow impedance and in conjunction with a crowned piston reduces clearance volume thereby improving both capacity and efficiency, and a high efficiency, dual strength drive motor. DOE

N84-20722# Leeds Univ. (England). Dept. of Chemical Engineering.
THE POTENTIAL OF THE SINGLE SCREW COMPRESSOR
G. G. Haselden *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 15 p refs (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

N84-20726# STAL Refrigeration, Norrkoeping (Sweden).
CAPACITY CONTROL OF SCREW COMPRESSOR UNITS
A. Lundberg *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 23 p refs (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N84-20866# Naval Ocean Systems Center, San Diego, Calif.
ACTIVE RELIABILITY ENGINEERING, TECHNICAL CONCEPT AND PROGRAM PLAN. A SOLID-STATE SYSTEMS APPROACH TO INCREASED RELIABILITY AND AVAILABILITY IN MILITARY SYSTEMS Final Report, May - Oct. 1982
D. D. Hall 5 Oct. 1983 105 p
(AD-A137541; AD-E301319; NOSC/TD-654) Avail: NTIS HC A06/MF A01 CSCL 09/2

A technical program plan for a technology base development of a self-repair concept for complex digital systems is presented in this document. The underlying technical concept provides for bridging the gap between traditional fault tolerance and standard passive reliability engineering techniques by the coupling of statistical techniques to the application of redundancy and use of intelligent control circuitry for switching between redundant units. This technique can provide significant increases in the statistical availability of Navy systems at reasonable increase in cost, even though it may not prove absolute tolerance of one or more faults. A program plan is presented for the development of this technology base as well as application to specific areas of interest, including multicomputer networks and VLSI/VHSIC integrated circuits.
Author (GRA)

N84-20867# Institute for Defense Analyses, Alexandria, Va. Science and Technology Div.
CAD/CAM TECHNOLOGY WORKING GROUP REPORT IDA/OSD R/M (INSTITUTE FOR DEFENSE ANALYSES/OFFICE OF THE SECRETARY OF DEFENSE RESEARCH AND MAINTAINABILITY) STUDY Final Report, Jul. 1982 - Aug. 1983
Jack D. Osborn Aug. 1983 225 p
(Contract MDA903-79-C-0018)
(AD-A137761; AD-E500616; IDA-D-30; IDA/HQ-83-25964) Avail: NTIS HC A10/MF A01 CSCL 15/3

The effective application of existing computer aided technologies and communications among subsets of computer aided technologies are issues addressed in an effort to apply computer techniques to quantum improvement in reliability, maintainability and productivity of weapons.
A.R.H.

N84-20868# Sandia Labs., Albuquerque, N. Mex. Vibration and Modal Testing Div.
STANDARD ENVIRONMENTAL TEST METHODS
David R. Schafer Dec. 1983 145 p refs Supersedes SC-4452D(M)
(Contract DE-AC04-76DP-00789)
(DE84-006471; DOE/DP-00789/T29; SC-4452E(M); SC-4452D(M)) Avail: NTIS HC A07/MF A01

Guide to uniformity in testing which is intended to be an aid to persons responsible for designing, developing, and performing environmental tests is presented. Checklists for preparing the environmental testing portion of product specifications copies of process standards covering the instrumentation, equipment, and methods for use in environmental testing are included. The version of SC-4452 reflects current state of the art and practice in environmental testing. Previously existing sections of the document are updated and new ones added.
DOE

N84-20869# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
DETECTION AND SIZING OF UNDERBEAD CRACKS USING ULTRASONIC NONDESTRUCTIVE EXAMINATION
J. D. Scarbrough and W. M. Wierzbicki [1983] 15 p refs Presented at the Golden Gate Met. and Welding Conf., San Francisco, 9-11 Feb. 1983
(Contract DE-AC09-76SR-00001)
(DE83-012205; DPSPU-82-30-11) Avail: NTIS HC A02/MF A01

Ultrasonic nondestructive examination (NDE) which will detect three mil deep underbead cracks in welds joining thin walled iridium hemishells is outlined. A correlation was developed to relate the amplitude of the signal reflected from the crack with crack wall area. The observed cracks occur in the weld underbead in the arc taper area during encapsulation of (238)PuO2 pellets for thermoelectric generators used in deep space exploration.
DOE

N84-20574*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
RELIABILITY AND MAINTAINABILITY ASSESSMENT FACTORS FOR RELIABLE FAULT-TOLERANT SYSTEMS
Salvatore J. Bavuso *In its* NASA Aircraft Controls Research, 1983 Mar. 1984 p 115-134 refs (For primary document see N84-20567 11-08)
Avail: NTIS HC A25/MF A01 CSCL 14D

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance.*

N84-20870 Northwestern Univ., Evanston, Ill.
ON THE MECHANICAL AND THERMOELECTRIC BEHAVIOR OF COMPOSITION MODULATED FOILS Ph.D. Thesis
Debasis Baral 1983 231 p
Avail: Univ. Microfilms Order No. DA8400648

In this dissertation the mechanical and thermoelectric properties of composition modulated Cu-Ni foils (unsupported films) are presented together with an in depth survey on the historical developments in composition modulated materials with wavelength less than 100 A. To understand the mechanical properties of textured foils, equations were derived to relate the crystallographic (primary) elastic constants to various measurable (secondary) moduli. Apparatus was constructed to measure the flexural, Young's and torsion moduli and Poisson's ratio of thin foils with thicknesses between 1 o 2 m. After verifying the validity of the derived equations and the accuracy of the equipment for pure and homogeneous foils, the method was utilized to determine the mechaical behavior of composition modulated foils. The films were deposited on mica and had an integral number of atomic planes of copper and nickel in each wavelength. The number of layers were varied between 2 and 20 to obtain constant composition and constant wavelength films.
Dissert. Abstr.

N84-20871 Texas Univ., Austin.
RELAXATION, REGULARITY AND OPERATOR THEORETICAL METHODS FOR A CLASS OF PROBLEMS IN NONLINEAR ELASTOSTATICS Ph.D. Thesis
Luis Manuel TrabuchodeCampos 1983 198 p
Avail: Univ. Microfilms Order No. DA8329813

The existence and regularity of solutions for a certain class of equilibrium problems in nonlinear elasticity are examined. Specifically, equilibrium solutions to a class of displacement problems for nonlinear elastic bodies as minimizers of nonquasiconvex energy functionals are studied. This is done using the idea of relaxation. The direct study of solutions to the equilibrium equations of finite elastostatics in what concerns local existence and regularity is also done. Intrinsic to this analysis is the fact that the solutions thus obtained are unique in the neighborhood of a certain reference configuration. In order to obtain the desired nonuniqueness known to exist in nonlinear elastostatics a continuity method is studied by successively increasing the applied external loads and by treating the successive configurations, thus obtained, as the new reference configurations.
Dissert. Abstr.

N84-20872 Minnesota Univ., Minneapolis.
SHEARING DEFORMATION OF SIMPLE MATERIALS Ph.D. Thesis
Amitabh Narain 1983 166 p

Avail: Univ. Microfilms Order No. DA8329568

This thesis is a contribution to qualitative and analytical understanding of the response of viscoelastic fluids and solids when discontinuous data is applied to the boundary of the material. Response to steady data and arbitrary unsteady data is also considered. The linearized dynamics of a simple fluid is considered for the start up of flow above a flat plate (Raleigh Problem) when the plate is moved along the plane by a step velocity or step displacement. The problem of the corresponding start up of Couette flow is also considered. It is shown that the response depends on the kernel function G(s) and particularly on its initial values G(0) and G(0). These weak solutions of the governing initial boundary value problems is then used to interpret popular experiments in Rheology involving impulsive start up of flow between two parallel plates. Finally, the effect of nonlinearity is shown in the case of a steady shearing data for a visco-elastic solid. Dissert. Abstr.

N84-20873 Lehigh Univ., Bethlehem, Pa.
A PSEUDO-ELASTIC MATERIAL DAMAGE MODEL INVOLVING LOCAL STIFFNESS CHANGE AND CRACK GROWTH Ph.D. Thesis
Peter Matic 1983 182 p
Avail: Univ. Microfilms Order No. DA8329471

Nonlinear structural response is the result of material yielding and/or fracture. Traditional methods of structural analysis address these two aspects of material behavior by separate failure criteria. In fact, yielding and fracture are intimately related by the irreversible microstructural processes that are responsible for both forms of material damage. A failure criterion which addresses both yielding and fracture based on the absorbed strain energy density of the material is presented. Higher values of strain energy density absorbed prior to fracture are associated with a higher material toughness. The fundamental hypotheses of the criterion are applied to a pseudo-elastic material. From the appropriate constitutive relation, increasing levels of strain energy density are associated with decreasing local stiffness of a material element. The range of material stiffness values delineate the regime of local nonlinear responses, from yield to fracture, available to describe the state of material damage in a structure. Dissert. Abstr.

N84-20874 Ohio State Univ., Columbus.
FREE VIBRATION ANALYSIS WITH BEAM MODELS WHICH INCLUDE BENDING WARPING, TORSION WARPING AND ANTICLASTIC BENDING EFFECTS Ph.D. Thesis
Mark Stephan Ewing 1983 138 p
Avail: Univ. Microfilms Order No. DA8400194

Vibration models for straight, constant cross-section, monrotating cantilever beams are considered with particular regard for those models which include shear deformation and rotary inertia. A review of existing models and articles bearing on improvements to these models is given. Three new models are introduced: (1) a combined bending and torsion model for beams of arbitary cross-section which includes torsion warping effects; (2) asymmetric bending model which includes bending warping effects; and, (3) asymmetric bending model which includes bending warping and antielastic bending effects. The combined bending and torsion model is used to predict natural frequencies for rectangular and curtate circular sector (annual sector) cross-section beams. The shear coefficient is calculated using Cowper's method and all other characteristic properties of the cross-section are exact, that is based on elasticity theory. Dissert. Abstr.

N84-20875 Ohio State Univ., Columbus.
FINITE ELEMENT INVESTIGATIONS OF THERMO-ELASTIC AND THERMO-PLASTIC CONSOLIDATION Ph.D. Thesis
Baher Labees Aboustit 1983 140 p
Avail: Univ. Microfilms Order No. DA8400148

The transient response of saturated continua due to thermal as well as mechanical loads is investigated in both elastic and plastic ranges. When the two phase saturated media are subjected to thermomechanical loading, the energy equation is coupled with the mass flow and solid deformation equations resulting in the initial boundary value problem of thermal consolidation. The solid behavior may be assumed to be either elastic or elastoplastic leading to the associated theories of thermoelastic and thermoelastoplastic consolidation. Numerous solutions to isothermal consolidation problems are available in the literature, but thermal consolidation response solutions are not available. Dissert. Abstr.

N84-20876 Northwestern Univ., Evanston, Ill.
ELASTIC QUARTER PLANE AND QUARTER SPACE BOUNDARY VALUE PROBLEMS Ph.D. Thesis
Jung-Chuan Lee 1983 76 p
Avail: Univ. Microfilms Order No. DA8400693

Boundary value problems for an elastic quarter plane and elastic quarter space are formulated and solved. The problems involve the removal of residual surface tractions. The analysis uses reflection to formulate and solve the problems which are reduced to two decouplable integral equations in which the unknown quantities are surface tractions of the appropriate half solids. The quarter plane problem determines the stress distributions arising from a dislocation at an arbitrary location. The dislocation solution is then used as a Green's function to solve the problem of an arbitrarily located crack in the quarter plane. Numerical results are provided for specific geometries. The quarter space problem is reinvestigated using a Green's function for concentrated normal and shear loading on an elastic quarter space. Dissert. Abstr.

N84-20877# Natal Univ., Durban (South Africa). Dept. of Electrical Engineering.
LABORATORY MEASUREMENTS OF SUBSYNCHRONOUS RESONANCE
D. J. N. Limebeer, R. G. Harley, M. A. Lahoud, and H. L. Nattrass 1980 14 p refs Presented at IFAC Symp., Pretoria, Sep. 1980 Sponsored in part by ESCOM, CSIR and the Atomic Energy Board
(RL-8845) Avail: NTIS HC A02/MF A01

A selection of results obtained from a laboratory system specially designed to investigate subsynchronous resonance are presented. This laboratory system was designed to model as closely as possible the nuclear powered turbo-generators to be installed at Koeberg power station in South Africa. In the case of some of the laboratory measurements, equivalent theoretical results are also presented in order to test the validity of the mathematical models being employed. The theory describing the system dynamics and some of the features of the laboratory system are presented. S.L.

N84-20878*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DEVELOPMENT OF A SIMPLIFIED PROCEDURE FOR CYCLIC STRUCTURAL ANALYSIS
Albert Kaufman Mar. 1984 20 p refs Proposed for presentation at the 29th ASME Intern. Gas Turbine Conf., Amsterdam, 3-7 Jun. 1984
(NASA-TP-2243; E-1855; NAS 1.60:2243) Avail: NTIS HC A02/MF A01 CSCL 20K

Development was extended of a simplified inelastic analysis computer program (ANSYMP) for predicting the stress-strain history at the critical location of a thermomechanically cycled structure from an elastic solution. The program uses an iterative and incremental procedure to estimate the plastic strains from the material stress-strain properties and a plasticity hardening model. Creep effects can be calculated on the basis of stress relaxation at constant strain, creep at constant stress, or a combination of stress relaxation and creep accumulation. The simplified method was exercised on a number of problems involving uniaxial and multiaxial loading, isothermal and nonisothermal conditions, dwell times at various points in the cycles, different materials, and kinematic hardening. Good agreement was found between these analytical results and nonlinear finite-element solutions for these problems. The simplified analysis program used less than 1 percent of the CPU time required for a nonlinear finite-element analysis. Author

N84-20879*# Lehigh Univ., Bethlehem, Pa.
STRESS INTENSITY FACTORS IN A REINFORCED THICK-WALLED CYLINDER
Renji Tang (Lanzhou Univ.) and F. Erdogan Feb. 1984 26 p refs
(Grants NGR-39-007-011; NSF MEA-82-09083)
(NASA-CR-172307; NAS 1.26:172307) Avail: NTIS HC A03/MF A01 CSCL 20K

An elastic thick-walled cylinder containing a radial crack is considered. It is assumed that the cylinder is reinforced by an elastic membrane on its inner surface. The model is intended to simulate pressure vessels with cladding. The formulation of the problem is reduced to a singular integral equation. Various special cases including that of a crack terminating at the cylinder-reinforcement interface are investigated and numerical examples are given. Results indicate that in the case of the crack touching the interface the crack surface displacement derivative is finite and consequently the stress state around the corresponding crack tip is bounded; and generally, for realistic values of the stiffness parameter, the effect of the reinforcement is not very significant.
M.G.

N84-20880*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATIC AND DYNAMIC STRUCTURAL-SENSITIVITY DERIVATIVE CALCULATIONS IN THE FINITE-ELEMENT-BASED ENGINEERING ANALYSIS LANGUAGE (EAL) SYSTEM
Charles J. Camarda and Howard M. Adelman Mar. 1984 80 p refs
(NASA-TM-85743; L-15659; NAS 1.15:85743) Avail: NTIS HC A05/MF A01 CSCL 20K

The implementation of static and dynamic structural-sensitivity derivative calculations in a general purpose, finite-element computer program denoted the Engineering Analysis Language (EAL) System is described. Derivatives are calculated with respect to structural parameters, specifically, member sectional properties including thicknesses, cross-sectional areas, and moments of inertia. Derivatives are obtained for displacements, stresses, vibration frequencies and mode shapes, and buckling loads and mode shapes. Three methods for calculating derivatives are implemented (analytical, semianalytical, and finite differences), and comparisons of computer time and accuracy are made. Results are presented for four examples: a swept wing, a box beam, a stiffened cylinder with a cutout, and a space radiometer-antenna truss. Author

N84-20881# National Aeronautical Establishment, Ottawa (Ontario).
IMPLEMENTATION OF NISITANI'S BODY FORCE METHOD FOR THE SOLUTION OF NOTCH PROBLEMS
W. E. Fraga and R. L. Hewitt Nov. 1983 54 p
(AD-A137690; NAE-AN-17; NRC-22831) Avail: NTIS HC A04/MF A01 CSCL 20/11

An outline of Nisitani's body force method is presented and details of the numerical implementation provided. Full details are provided for the solution of several problems including single cracks or single elliptical notches in semi-infinite plates as well as the problem of an embedded crack near a semi-elliptical notch in a semi-infinite plate. Author (GRA)

N84-20882# National Aeronautical Establishment, Ottawa (Ontario).
COMPARISON OF THE STRESS CONCENTRATION FACTOR OF A HOLE NEAR A CIRCULAR EDGE NOTCH WITH AN ENGINEERING ESTIMATE
W. E. Fraga and R. L. Hewitt Nov. 1983 18 p
(AD-A137691; NAE-AN-18; NRC-22825) Avail: NTIS HC A02/MF A01 CSCL 20/11

The stress concentration factor for a hole near a circular edge notch has been determined using Nisitani's body force method and compared with some engineering approximations. For a hole close to the notch the error in the approximation was about 6% but decreased to near zero as the hole was placed further away. The stress concentration at the root of the edge notch was found to be decreased in the presence of a hole close to the notch because of the interaction between the hole and the edge of the plate. Author (GRA)

N84-20883# Oklahoma Univ., Norman. School of Aerospace, Mechanical and Nuclear Engineering.
A CRITICAL EVALUATION OF NEW PLATE THEORIES APPLIED TO LAMINATED COMPOSITES
C. W. Bert Aug. 1983 29 p
(Contract N00014-78-C-0647)
(AD-A137789; OU-AMNE-83-3; TR-35) Avail: NTIS HC A03/MF A01 CSCL 12/1

The plate theory recently developed by Levinson is extended to laminates. Closed-form solutions of this theory, as well as those of Reissnet-Mindlin plate theory with appropriate shear correction, Seide's discrete-layer plate theory, and Lo, Christensen, and Wu's higher-order theory are all compared with Pagano's elasticity-theory solution for the cases of cylindrical bending of a single orthotropic layer and a symmetric cross-ply (0 deg/90 deg/0 deg) laminate consisting of three equal-thickness layers. Quantities compared are maximum plate deflection, bending stress distribution, and transverse shear stress distribution. Author (GRA)

N84-20884# Materials Research Labs., Ascot Vale (Australia).
BENDING OF BEAMS SUBJECTED TO TRANSVERSE IMPACTS
R. L. Woodward Apr. 1983 24 p
(AD-A137840; MRL-R-886) Avail: NTIS HC A02/MF A01 CSCL 20/11

Transverse projectile impacts on the ends of free-free beams of circular cross section produced evidence of hinges in the beams and strain distributions which could be used for comparisons with a rigid-plastic approach to the dynamic response of structures and for comparisons with a finite element computer code solution. The rigid-plastic approach describes the mechanism of bending and hinge development and motion correctly but the simplifications inherent in the model prevent it from accurately predicting the detail. The computer code EPIC-2 gives extremely good simulations of the problem. Author (GRA)

N84-20885# Air Force Academy, Colo.
PULLOUT OF A RIGID INSERT ADHESIVELY BONDED TO AN ELASTIC HALF PLANE Final Report, Apr. 1981 - Dec. 1983
G. K. Haritos and L. M. Keer Dec. 1983 33 p
(AF Proj. 2308)
(AD-A137859; FJSRL-TR-83-0017) Avail: NTIS HC A03/MF A01 CSCL 20/11

The problem considered here is that of a finite, rigid insert partially embedded in and adhesively bonded to an elastic half plane. Two distinct problems are investigated: the shear pullout of the insert without rotation, which takes into account the adhesive's resistance to shear deformation, and an opening problem which incorporates the adhesive's resistance to normal deformation. This latter problem assumes the presence of an edge crack in the half plane subjects to opening pressure which equals in magnitude the normal stress distribution due to the pullout problem. These mixed boundary value problems are governed by singular integral or integrodifferential equations. Numerical results are obtained via a technique introduced by Gerasoulis and Srivastav. Several important physical quantities are calculated, such as the shear and normal stress distributions along the bonded interface, and the crack opening displacements. GRA

N84-20886# Embry-Riddle Aeronautical Inst., Daytona Beach, Fla.
OPTIMIZATION FOR VIBRATION ISOLATION Final Report, 30 Jun. 1981 - 29 Jun. 1983
Wayne V. Nack Aug. 1983 30 p
(Grant AF-AFOSR-0266-81; AF Proj. 2307)
(AD-A137895; AFOSR-84-0012TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

An almost linear optimization problem of importance in vibration isolation has been identified and algorithms were developed to minimize the forced vibrational response of structural systems.

The constraints can be either displacements of accelerations. These algorithms have been studied for transient response, frequency response and stationary random using the direct dynamic solution. Multiple response points and loading conditions may be used. Author (GRA)

N84-20887# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering Aeronautical Engineering and Mechanics.
THE ANALYSIS OF ELASTIC-PLASTIC DEFORMATION AND STRESS AT FINITE STRAIN AND THEIR EVALUATION Final Report, 1 Jan. 1982 - 30 Sep. 1983
E. H. Lee and R. L. Mallett 30 Dec. 1983 17 p
(Contract DAAG29-82-K-0016)
(AD-A137931; RPI-Metal-Forming-8/83; ARO-19063.5-EG) Avail: NTIS HC A02/MF A01 CSCL 12/1

The facility of structural metals to be deformable to large strains without fracturing is often needed in the manufacturing of structural components (metal forming) and in the operation of a structure (e.g., armor penetration, crashworthiness and earthquake resistance). Rational design of a structure therefore often demands stress and deformation analysis in the presence of finite strain. Investigations of several aspects of elastic-plastic theory at finite deformation have been carried out on this project including the nonlinear coupling of elastic and plastic strains when the deformation is large, the representation and analysis of plastic strain-induced anisotropy and the evaluation of stress distributions in forming processes by the finite-element method. Of particular interest and importance, because what was until recently thought to be the correct formulation of the theory turned out to introduce huge errors in stress analysis, is the prediction of stress and deformation distributions in material exhibiting plastic strain-induced anisotropy of the type associated with the Bauschinger effect. State-of-the-art calculations presented at a workshop, co-sponsored by ARO, predicted oscillating shear stress generated by monotonically increasing shear strain to large strains. GRA

N84-20888# Southwest Research Inst., San Antonio, Tex.
STUDY OF THE EFFECTS OF METALLURGICAL FACTORS ON THE GROWTH OF FATIGUE MICROCRACKS Final Report, 1 Nov. 1980 - 31 Oct. 1983
James Lankford Jan. 1984 11 p
(Contract DAAG29-80-K-0034)
(AD-A137954; SWRI-06-4231; ARO-17401.6-MS) Avail: NTIS HC A02/MF A01 CSCL 20/11

The micromechanics of crack tip yielding are characterized for large and small fatigue cracks in aluminum alloys. Techniques used included selected area electron channeling and stereoimaging strain analysis. The anomalous fast growth of small fatigue cracks correlated with greater crack tip strains and displacements, and lower crack opening loads, for microcracks as compared with large cracks. Microcrack growth rate perturbations were modeled in terms of grain boundary induced reductions in crack tip strain.
Author (GRA)

N84-20889# California Univ., Livermore. Lawrence Livermore Lab.
FREQUENCY DOMAIN APPROACH TO STRUCTURAL ANALYSIS
H. Joseph Weaver 1 Mar. 1983 46 p refs
(Contract W-7405-eng-48)
(DE84-005110; UCID-19950) Avail: NTIS HC A03/MF A01

A mathematical model, the single degree of freedom (SDOF) of the structure is first constructed to conduct a forced vibration analysis. Solution of the model in the time domain using the impulse response and the fast Fourier transform methods are described prior to introducing the frequency domain approach. The solution in the frequency domain, which involves the eigenfunctions and transfer functions of the system, is performed. The relationship between the time and frequency domain solutions is discussed, and the transfer function of a general structure is derived. the models are analyzed for displacement, velocity, or acceleration by using the Fourier transform method. The response spectrum of a structural system may be determined. DOE

N84-20890# Sydney Univ. (Australia). School of Civil and Mining Engineering.
NONLINEAR ANALYSIS OF THIN-WALLED I-SECTIONS IN BENDING
Gregory J. Hancock Jun. 1983 38 p refs
(PB84-137918; R-448) Avail: NTIS HC A03/MF A01 CSCL 20K

A local buckling and nonlinear elastic study of thin-walled I-sections subjected to major axis bending are described. The local buckling modes of I-beams with slender webs using the finite strip method of buckling analysis of plate assemblies; a summary of a nonlinear elastic analysis method based on the finite strip method of structural analysis of plate assemblies; and a study of three different I-sections with different section geometries and with different levels of imperfection is performed using the nonlinear analysis are presented. GRA

N84-20823# Sandia Labs., Albuquerque, N. Mex.
EFFECT OF MEASUREMENT SYSTEM PHASE RESPONSE ON SHOCK SPECTRUM COMPUTATION
Patrick L. Walter *In* Range Commanders Council Twelfth Transducer Workshop 1983 p 360-376 refs (For primary document see N84-20809 11-35)
(AD-P002688) Avail: NTIS HC A99/MF A01 CSCL 20/11

42 GEOSCIENCES (GENERAL)

N84-20891# Joint Publications Research Service, Arlington, Va.
USSR REPORT: EARTH SCIENCES
29 Mar. 1984 65 p Transl. into ENGLISH from various Russian articles
(JPRS-UES-84-003) Avail: NTIS HC A04

Progress and research on earth sciences are reported. Issues in the following disciplines are discussed: meteorology, oceanography, terrestrial geophysics, atmospheric physics, and arctic and antarctic research. For individual titles, see N84-20892 through N84-20902.

N84-20892# Joint Publications Research Service, Arlington, Va.
MEASURES TO IMPROVE ANTI-HAIL SERVICE **c47**
Yu. Sedunov *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 1-3 Transl. into ENGLISH from Pravda (USSR), 5 Oct. 1983 p 3 (For primary document see N84-20891 11-42)
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A method to prevent hail formation and reduce its dimensions was developed. The cloud structure, zones of intense precipitation and the appearance of heavy particles are determined by radar containing silver iodide. A reagent is introduced to the cloud. The combustion of one gram of reagent forms up to 1014 nuclei for crystalline particles. These particles, by natural addition to the crystalline nuclei, collect a determined part of the moisture and more hailstones are formed. On the way to the ground they thaw and reach the Earth as rain. E.A.K.

N84-20893# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FREELY ASCENDING CONVECTIVE JETS INITIATED BY ACTIVE ADMIXTURE **c46**
L. Kh. Ingel *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 4 Transl. into ENGLISH from Izv. Akad Nauk SSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 987-988 (For primary document see N84-20891 11-42)
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The nonlinear dynamics of convective turbulent jets over isolated stationary sources of a weightless heat releasing admixture were studied. This problem is examined in connection with the proposal for artificial modification of some atmospheric processes by an admixture (coal dust, soot) absorbing solar radiation. The dynamics of axisymmetric and plane jets with neutral and stable stratification, including a stratification nonuniform with altitude were examined. The heat source is a transportable substance which is distributed in the entire volume of the jet. Convection with a

heat-releasing admixture in a stable stratified medium is described. It has a clear physical sense: the increase in buoyancy which is associated with heat release in each convective element is compensated by rising into less dense layers of the surrounding medium. E.A.K.

N84-20894# Joint Publications Research Service, Arlington, Va.
MEASUREMENTS OF COEFFICIENT OF TURBULENT DIFFUSION IN MIDDLE-LATITUDE STRATO- AND MESOSPHERE
V. F. Barbuzenko, V. T. Surkov, and A. A. Khananyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 10, Oct. 1983 p 1089-1091 (For primary document see N84-20891 11-46)
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Small scale turbulence in the middle latitude stratomesosphere was studied. The artificial clouds were ejected into the atmosphere with special vaporizers carried aboard a meteorological rocket. The clouds which formed at heights in the strato and mesosphere were photographed from ground observation points. After completing ejection into the atmosphere a vertical trail was left with an extent of 30-35 km and an initial diameter of 10-15 m. The cloud moved under the influence of prevailing winds, changed form under the influence of vertical wind shears and expanded in a direction transverse to the axis under the influence of small-scale turbulence. The distribution curves of optical density which corresponded to the distribution of the concentration of matter in the cloud along the horizontal direction were determined for different moments in time. The dispersions of displacement of cloud particles relative to the instantaneous center of gravity were computed. It is indicated that the diffusion of the cloud in two mutually perpendicular horizontal directions within the limits of measurement error occurs with identical diffusion coefficients. E.A.K.

N84-20895# Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON OCEAN MONITORING HELD IN TALLINN **c48**
In its USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 6-7 Transl. into ENGLISH from Sov. Est. (USSR), 2 Oct. 1983 p 3 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

Comprehensive global monitoring of the great oceans was discussed. Monitoring denotes observation, keeping track of changes in the environment, with the use of the most precise methods of measurement possible. A systems approach to tracking the quantitative indices of the environment, the seriousness of this approach to an important problem of environmental protection and rational use of natural resources is outlined. Monitoring of the great oceans as part of the biosphere is an important problem for the whole globe. Solving the important global issue which involves ecological, chemical and physical aspects of the life and health of the ocean, is emphasized. E.A.K.

N84-20896# Joint Publications Research Service, Arlington, Va.
SEISMOLOGICAL MEASUREMENTS ON OCEAN FLOOR **c48**
S. L. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 13-21 Transl. into ENGLISH from Zemlya i Vselennaya (USSR), no. 4, Jul. - Aug. 1983 p 17-21 (For primary document see N84-20891 11-42)
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The development of different methods to register seismic tremors on the ocean floors is described. A total of 85% of all earthquake foci are hidden beneath the waters of oceans and seas. It is asserted that seismology should be a marine science, however, it continues to remain a land science. Several main directions are noted in marine seismology which include the study of the internal structure of the Earth, the causes of the seismic process and its laws, its relationship to the general evolution of the earth and prediction of seismicity. E.A.K.

N84-20897# Joint Publications Research Service, Arlington, Va.
SOVIET INVESTIGATIONS OF EARTH'S GRAVITY FIELD **c46**
M. Ye. Kheyfets *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 42-49 Transl. into ENGLISH from Zemlya i Vselennaya (USSR), no. 6, Nov. - Dec. 1983 p 23-27 (For primary document see N84-20891 11-42)
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The general gravimetric survey in the USSR which began more than 50 years ago is discussed. Its application infuences the study of the Earth's figure and internal structure, exploration for minerals and space exploration. E.A.K.

N84-20898# Joint Publications Research Service, Arlington, Va.
DETERMINING DENSITY OF UPPER MANTLE ROCKS **c46**
N. A. Shilo and Yu. Ya. Vashchilov *In* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 50-51 Transl. into ENGLISH from Dokl. Akad. SSSR (USSR), v. 273, no. 3, Nov. 1983 p 695-698 (For primary document see N84-20891 11-42)
Avail: NTIS HC A04

A method to determine the density of upper mantle rocks is presented. The method is based on the results of a total quantitative interpretation of gravity anomalies. The density determination method is outlined. E.A.K.

N84-20899# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF STRATOSPHERIC AEROSOLS FORMING DURING COMBUSTION OF ROCKET FUELS ON EARTH'S ALBEDO **c46**
F. B. Yurevich, G. M. Yatskevich, and R. D. Cess *In* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 52 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 988-990 (For primary document see N84-20891 11-42)
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The effects of particles in the stratosphere was examined. It was postulated that the flight of space vehicles can considerably increase the concentration of stratospheric Al2O3 aerosol which may lead to possible climatic changes. The particle size distribution which sets the possible upper limit of particle size and the influence of albedo on change in the Earth's climate were investigated. It is found that an increase in the quantity of Al2O3 aerosol could increase the Earth's albedo, which could lead to an increase in the solar radiation assimilated by the planet and accordingly its cooling. The changes in albedo caused by aerosol are analyzed. E.A.K.

N84-20900# Joint Publications Research Service, Arlington, Va.
DETERMINING OPTICAL CHARACTERISTICS OF STRATOSPHERIC AEROSOL BY MULTIFREQUENCY LASER SOUNDING METHOD **c46**
E. V. Makiyenko and I. E. Naats *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 53 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 991-994 (For primary document see N84-20891 11-42)
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A method to determine the spectral variation of the aerosol scattering coefficient in the lower stratosphere on the basis of data from multifrequency laser sounding is presented. It is demonstrated that a determination of the optical characteristics of stratospheric aerosol by a three frequency lidar can be accomplished. This is true both in the visible range and in the near IR region. The use of the second harmonic of a ruby laser as the lidar quarter wavelength makes it possible to increase the reliability of the retrieved values of the scattering attenuation coefficient in the near UV spectral region. It is found that it is possible to retrieve the spectral variation of the scattering coefficient, and any other optical characteristics of light scattering, including polarization characteristics. E.A.K.

N84-20901# Joint Publications Research Service, Arlington, Va.
ALTITUDINAL CHANGE IN CONTINUOUS ABSORPTION IN

ATMOSPHERIC TRANSPARENCY WINDOW 8-12 MICRONS c46
G. V. Telegin and V. V. Fomin *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 53-54 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 995-998 (For primary document see N84-20891 11-42)
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The behavior of continuous absorption with altitude was selected. A complex relationship between line shape and total and partial pressures, as well as gas temperature was established. The principal contribution to the total optical thickness is from the lower km layer. Both parts of continuous absorption can be computed by a generalized spectral line contour, which enables a correct approximation of both the frequency variation and the temperature depends of both parts. E.A.K.

N84-20902# Joint Publications Research Service, Arlington, Va.
VERTICAL TEMPERATURE GRADIENT IN TROPOSPHERE AND ITS RELATIONSHIP TO SURFACE TEMPERATURE ACCORDING TO EMPIRICAL DATA c46
I. I. Mokhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 54-55 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 913-919 (For primary document see N84-20891 11-42)
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The gamma parameter which is an important characteristic of the Earth's climate system was examined. The difficulty in analyzing this parameter is the global nature of the mechanisms of formation of the vertical temperature gradient and the feedbacks in the Earth's climate system dependent on it. The mean gamma gradient in the heights of the troposphere is not constant and varies both in time and space, with latitude and in the annual variation. The vertical temperature gradient gamma for the troposphere was clarified. The vertical distribution of temperature in different latitude zones of the Northern Hemisphere in the annual variation and in a mean annual regime are considered. The results obtained using different empirical data are compared. E.A.K.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography.*

N84-20903 California Univ., San Diego.
SATELLITE OBSERVATIONS OF FRONTS AND FRONTAL MEANDERS IN THE CENTRAL NORTH PACIFIC OCEAN Ph.D. Thesis
Michael Lewis VanWoert 1983 129 p
Avail: Univ. Microfilms Order No. DA8400013

This thesis combines satellite-derived estimates of sea-surface temperature and in situ data collected as part of the FRONTS 80 field program to describe mid-ocean fronts and frontal meanders in the Central North Pacific Ocean. Detailed comparisons were made between the satellite data and the in situ fields of temperature, salinity and density. Close agreement was found between the patterns derived from the satellite data and the in situ data to roughly 1000 m, thus indicating that the feature observed by the satellite was not a surface phenomenon but rather the surface manifestation of a deep dynamically active feature. With a knowledge that wintertime features in the Central North Pacific Ocean represent deep, dynamically active structures, a search for other meanders was undertaken. The results of the search indicated that many coherent mesoscale meanders exist with wavelengths of approx. 250 km and amplitudes of 100-400 km. It was also noticed that the features amplified with time. To quantify this development the evolution time scale for two features was estimated. Dissert. Abstr.

N84-20904# Instituto de Pesquisas Espaciais, Sao Paulo (Brazil).
EFFECT OF THE ANGLE OF OBSERVATION AND OF SURFACE ROUGHNESS IN THE SPECTRAL BEHAVIOR OF SOILS UNDER VARIED MOISTURE CONDITIONS [EFEITO DO ANGULO DE OBSERVACAO E DA RUGOSIDADE SU PERFICIAL NO COMPORTAMENTO ESPECTRAL DE SOLOS SOB CONDICOES HIDRICAS TEMPORALMENTE VARIAVEIS]
Jose Carlos Neves Epiphanio Jun. 1983 47 p refs In PORTUGUESE; In PORTUGUESE; ENGLISH summary
(INPE-2777-RPE/436) Avail: NTIS HC A03/MF A01

An experiment conducted on an Oxisol in Central Brazil is described. The experiment consisted of two bare soil plots, an irrigated one and a dry one, with two repetition times. A reflectance factor over 8 wavelengths - 450, 500, 550, 600, 650, 750, 850 and 1050 nm - was obtained. The objectives of this research were to attend the soil spectral behavior under different moisture conditions, as well as to characterize the 0 deg and 90 deg (azimuthal angles) observation directions influences on behavior and differentiation possibility between two plots. At initial stage, before irrigation, both plots presented similar surfaces characterized by relatively large soil aggegates and accentuated roughness. During irrigation, the aggregates of the plot being irrigated were dispersed into finer particles and reordered into a more compact sediment layer. As a result, the surface of this plot had a homogeneously smoother surface than the nonirrigated plot. Author

N84-20905*# Arizona Univ., Tucson. Optical Sciences Center.
SPECTRORADIOMETRIC CALIBRATION OF THE THEMATIC MAPPER AND MULTISPECTRAL SCANNER SYSTEM Quarterly Report, 1 Nov. 1983 - 1 Feb 1984
James M. Palmer and Philip N. Slater [1983] 35 p refs
(Contract NAS5-27382)
(NASA-CR-175405; NAS 1.26:175405; QR-5) Avail: NTIS HC A03/MF A01 CSCL 14B

The results of an analysis that relates thematic mapper (TM) saturation level to ground reflectance, calendar date, latitude, and atmospheric condition is provided. A revised version of the preprint included with the last quarterly report is also provided for publication in the IEEE Transactions on Geoscience and Remote Sensing. Author

N84-20906# Air Force Geophysics Lab., Hanscom AFB, Mass.
TERRAIN VARIABLES IMPROVE MODELING OF RICHARDSON NUMBERS LESS THAN UNITY IN THE LOWER ATMOSPHERE Interim Report
Edmund A. Murphy, Kathryn G. Scharr, and Joseph P. Noonan 22 Aug. 1983 16 p
(AF Proj. 6687)
(AD-A137926; AFGL-TR-83-0226; AFGL-ERP-850) Avail: NTIS HC A02/MF A01 CSCL 08/2

Occurrences of turbulence based on a critical Richardson number, obtained using data from nine rawinsonde stations for the years 1971-1975, are compared to show evidence of mountain induced effects in the lower atmosphere. The nine stations were selected since they could be divided into three groups by latitude. Two of the stations in each group are located in the Midwestern Plains and the third in the Western Mountain Region. Results from these comparisons led to the creation of a variable to indicate station terrain type for inclusion in an existing regression model. The improved model employing stepwise multiple regression techniques uses terrain, location, and seasonal information.
Author (GRA)

N84-20907# California Univ., Livermore. Lawrence Livermore Lab.
ALTERANT GEOPHYSICAL TOMOGRAPHY
A. L. Ramirez and R. J. Lytle May 1983 5 p refs Presented at the Intern. Geosci. and Remote Sensing Symp., San Francisco, 31 Aug. - 2 Sep. 1983 Sponsored in part by the Nuclear Regulatory Commission
(Contract W-7405-eng-48)
(DE84-004794; UCRL-89190; CONF-830870-2) Avail: NTIS HC A02/MF A01

A new geophysical technique used to remotely map fractures between boreholes: alterant geophysical tomography (AGT) was evaluated. The method requires that the attenuation properties of rock fractures be altered by forcing into the rock a fluid with different electrical properties than those of the native fluids in the rock. Measurements of electromagnetic attenuation factor are performed before and after the tracer is used. Measuring changes in attenuation properties offers significant advantages over measuring absolute attenuation properties. DOE

N84-20908# Sandia Labs., Albuquerque, N. Mex.
MAPPING THE ACID STIMULATION IN THE BEOWAWE GEOTHERMAL FIELD USING SURFACE ELECTRICAL POTENTIALS
Carolyne M. Hart, Dennis Engi, and Harry E. Morris 1983 6 p refs Presented at conference
(Contract DE-AC04-76DP-00789)
(DE84-004995; SAND-83-2416C; CONF-831253-1) Avail: NTIS HC A02/MF A01

A surface electrical potential system was fielded during the chemical stimulation of the Rossi 21-19 well in the Beowawe Geothermal Field. The techniquue, which measures variations in resistivity resulting from the flow of conductive fluid into the reservoir, was not only shown to be highly sensitive to the chemical treatment, but was also responsive to in situ conductive zones before any acid injection. A review of the experiment and a preliminary interpretation of the data are presented. The data provide convincing evidence that it should be possible to map the treated zone as well as the primary pretreatment in situ conductive zones. DOE

N84-20909# Du Pont de Nemours (E. I.) and Co., Aiken, S.C.
WATER LEVEL MEASUREMENT NETWORK COMPUTER FILE
Charles W. Krapp and L. Dewain McClain 25 Aug. 1982 20 p
(Contract DE-AC09-76SR-00001)
(DE84-005388; DPST-83-307) Avail: NTIS HC A02/MF A01

A computer system has been developed to manage the water level measurement network used for hydrologic studies of specific plant areas and the region. Water level data for 150 wells has been entered with a time span ranging from one to 20 years of monthly measurements. Using the flexibility of the Statistical Analysis System (SAS), the data can be retrieved in tabular or in graphical form. This system has been in use since 1979 and is updated routinely by technicians. Approximately, two man months of effort have been required for program design, data entry, and current revisions. DOE

N84-20910# Sandia Labs., Albuquerque, N. Mex. Earth Sciences Div.
MODELING OF THE REGIONAL HYDRAULICS OF THE RUSTLER FORMATION Interim Report
George E. Barr, Warren B. Miller, and Don Diego Gonzalez Dec. 1983 55 p refs
(Contract DE-AC04-76DP-00789)
(DE84-005859; SAND-83-0391) Avail: NTIS HC A04/MF A01

The finite element code ISOQUAD was used to simulate the head distribution within the two major water bearing units. Calculated migration of a continuously injected contaminant from an assumed smeared point source at the center of the site was observed. Migration rates of specific concentration fronts decreaswd with increasing time. The average rate of movement of the 10(+3) relative concentration contour was less than 10m/y for the first 800 y in the Culebra Dolomite. The plume calculation overestimates the actual rate of movement of contaminants. Particle velocities for selected streamlines, more characteristic of contaminant movement, are calculated. These particle velocities indicate groundwater travel times of approx. 130,000 y from the center of the WIPP site to a distance of 12.9 km (8 mi). The validity of the porous medium aproximation of the Rustler aquifers was examined by the evaluation of the drawdown portion of aquifer pump tests. Drawdown curves were successfully duplicated as a function of hydraulic conductivity, storativity, and well radius. It is indicated that there are no significant fluid bearing fractures or channels within 60 m of tested wells. DOE

N84-20911# National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Environmental Research Lab.
INVESTIGATION OF THE CURRENTS AND DENSITY STRUCTURES OF LAKE ERIE
J. H. Saylor and G. S. Miller Jul. 1983 92 p refs
(PB84-140334; NOAA-TM-ERL-GIERL-49; NOAA-84010302) Avail: NTIS HC A05/MF A01 CSCL 08H

Currents and water temperatures were recorded at a large scale grid of fixed moorings in Lake Erie from May 1979 through June 1980. Thermistor chains were used to record the complete development and decay of central basin stratification. First a fragile stability develops, which is very susceptible to high wind stress. Currents measured in the lower half of the central basin water column were mostly return flows driven by the surface pressure gradient. A complex system of Lake Erie circulation gyres as predicted by models was observed. Tidal like currents driven by the longitudinal seiches of Lake Erie control the island filled passages between the western and central Lake Erie basins, with currents across the whole island chain very much in phase. GRA

N84-20912# Maine Univ., Orono.
COMPUTER SIMULATION OF PHOSPHORUS CYCLING IN THE SEDIMENT-WATER SYSTEM OF EUTROPHIC LAKES
T. A. Hannula and C. A. Rock Aug. 1983 164 p refs
(Contract DI-14-34-0001-1231)
(PB84-140573; W84-00964; OWRT-8-021-ME(1)) Avail: NTIS HC A08/MF A01 CSCL 08H

The release of phosphorus from the sediments of eutrophic lakes is a major factor in the excessive productivity of these lakes. Using the diagenic partial differential equations which model the sediment processes of lakes and oceans, a computer simulation model was developed to study the P dynamics in Lake sediments. The model allows both time and depth variation of the key equation parameters and clearly shows that the upper 10 cm of sediment is the main region of activity. The model generates summary tables and 3D plots of key variables over a year's simulation. Data from L. Sebasticook, Newport, Maine are used to test the model. GRA

N84-20913# National Academy of Sciences - National Research Council, Washington, D. C. Committee to Evaluate DOE's Arctic Terrestrial Environmental Research Programs.
ARCTIC TERRESTRIAL ENVIRONMENTAL RESEARCH PROGRAMS OF THE OFFICE OF ENERGY RESEARCH, DEPARTMENT OF ENERGY: EVALUATIONS AND REOMMENDATIONS. APPENDIX B: COMPONENTS OF AN ARCTIC TERRESTRIAL ENVIRONMENTAL RESEARCH PROGRAM
1983 30 p Workshop held at Boulder, Colo., 21-23 Nov. 1982
(Contract DE-FG01-81ER-60021)
(PB84-129766) Avail: NTIS HC A03/MF A01 CSCL 08I

A research plan, research priorities, possible sites for research, and criteria for site selection are suggested for long term studies of the environmental effects of energy-related development in the terrestrial Arctic region. The impact of and recovery from disturbances to riparian ecosystems, slopes, drainage patterns, air quality, and vegetation are of prime interest. A.R.H.

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N84-20914 Brown Univ., Providence, R. I.
A STUDY OF HETEROJUNCTION SOLAR CELLS BASED ON

n-CdS AND SEVERAL P-TYPE SEMICONDUCTORS Ph.D. Thesis
Rajeela Rashmikant Arya 1983 194 p
Avail: Univ. Microfilms Order No. DA8325947

Heterojunction solar cells offer several advantages over p-n homojunction solar cells. The window absorber structure reduces the top surface recombination losses which occur in p-n homojunctions; it allows the use of two semiconductors, one of which only is doped n-type and the other only p-type; and some of these semiconductors are deposited by low temperature processes, such as vacuum evaporation, sputtering, or chemical spray pyrolysis. Heterojunction solar cells in which the window material is a thin film of cadmium sulphide were prepared and studied. The cadmium sulphide thin films were deposited by vacuum evaporation from a single resistance heated crucible. A process which rests on the stoichiometry of the CdS source material (powder) and the proper choice of deposition parameters was developed. These films were characterized for their structural, compositional, electrical, and optical behavior. Author

N84-20915*# Trane Co., LaCrosse, Wis.
HEAT RECOVERY SUBSYSTEM AND OVERALL SYSTEM INTEGRATION OF FUEL CELL ON-SITE INTEGRATED ENERGY SYSTEMS Final Report
Louis J. Mougin 15 Jul. 1983 134 p
(Contract DEN3-241)
(NASA-CR-168309; DOE/NASA-0241-12; NAS 1.26:168309) Avail: NTIS HC A07/MF A01 CSCL 10A

The best HVAC (heating, ventilating and air conditioning) subsystem to interface with the Engelhard fuel cell system for application in commercial buildings was determined. To accomplish this objective, the effects of several system and site specific parameters on the economic feasibility of fuel cell/HVAC systems were investigated. An energy flow diagram of a fuel cell/HVAC system is shown. The fuel cell system provides electricity for an electric water chiller and for domestic electric needs. Supplemental electricity is purchased from the utility if needed. An excess of electricity generated by the fuel cell system can be sold to the utility. The fuel cell system also provides thermal energy which can be used for absorption cooling, space heating and domestic hot water. Thermal storage can be incorporated into the system. Thermal energy is also provided by an auxiliary boiler if needed to supplement the fuel cell system output. Fuel cell/HVAC systems were analyzed with the TRACE computer program. S.L.

N84-20916*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
VOLTAGE CONTROLLING MECHANISMS IN LOW RESISTIVITY SILICON SOLAR CELLS: A UNIFIED APPROACH
V. G. Weizer, C. K. Swartz, R. E. Hart, and M. P. Godlewski 4 May 1984 13 p refs Presented at 17th Photovoltaic Specialists Conf., Kissimmee, Fla., 1-4 May 1984; sponsored by IEEE
(NASA-TM-83612; NAS 1.15:83612) Avail: NTIS HC A02/MF A01 CSCL 10A

An experimental technique capable of resolving the dark saturation current into its base and emitter components is used as the basis of an analysis in which the voltage limiting mechanisms were determined for a variety of high voltage, low resistivity silicon solar cells. The cells studied include the University of Florida hi-low emitter cell, the NASA and the COMSAT multi-step diffused cells, the Spire Corporation ion-implanted emitter cell, and the University of New South Wales MINMIS and MINP cells. The results proved to be, in general, at variance with prior expectations. Most surprising was the finding that the MINP and the MINMIS voltage improvements are due, to a considerable extent, to a previously unrecognized optimization of the base component of the saturation current. This result is substantiated by an independent analysis of the material used to fabricate these devices. Author

N84-20917*# National Aeronautics and Space Administration. Pasadena Office, Calif.
INCREASED VOLTAGE PHOTOVOLTAIC CELL Patent Application
Bernd Ross (JPL, California Inst. of Tech., Pasadena), Donald B. Bickler (JPL, California Inst. of Tech., Pasadena), and Brian D. Gallagher, inventors (to NASA) (JPL California Inst. of Tech., Pasadena) Filed 8 Feb. 1984 10 p
(Contract NAS7-100)
(NASA-Case-NPO-16155-1; US-Patent-Appl-SN-578390) Avail: NTIS HC A02/MF A01 CSCL 10A

A prior art solar cell which includes a silicon substrate and a silicon layer which are oppositely doped, one being p-doped and one being n-doped, is improved by including a second layer of silicon carbide on the first silicon layer. Preferably, the silicon carbide layer has the same type of doping as the silicon layer beneath it. The second layer increases the width of the depletion zone formed between the substrate and the first layer so that the voltage across the depletion zone can increase to a higher level and thus increase the voltage and efficiency of the photovoltaic cell. The carbon-containing second layer is desirable because a crystalline carbon such as silicon carbide is largely transparent to sunlight and allows large amounts of photons to pass through to produce a large current. NASA

N84-20918*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
THERMIONIC-PHOTOVOLTAIC ENERGY CONVERTER Patent Application
Donald L. Chubb, inventor (to NASA) Filed 15 Feb. 1984 10 p
(NASA-Case-LEW-14077-1; US-Patent-Appl-SN-580573) Avail: NTIS HC A02/MF A01 CSCL 10A

A thermionic photovoltaic energy conversion device comprised of a thermionic diode mounted within a hollow turbular photovoltaic converter is described. The thermionic diode maintains a cesium discharge for producing excited atoms that emit line radiation in the wave length region of 850 nm to 890 nm. The photovoltaic converter is a silicon or gallium arsenide photovoltaic cell having bandgap energies in this same wavelength region for optimum cell efficiency. NASA

N84-20919# Applied Solar Engineering, Inc., San Antonio, Tex.
WIND ENERGY SYSTEMS PROGRAM SUMMARY, FISCAL YEARS 1981 AND 1982
Jan. 1983 219 p refs
(DE84-002958; DOE/CE-0048) Avail: NTIS HC A10/MF A01

The federal wind energy program activities during fiscal years (FY) 1981 and 1982 are reviewed. The research, development, and support efforts are highlighted. The summary includes: a review of program progress to date; program organization and functional responsibilities; program elements and budget; project summaries of major contracts; and a list of key FY 1981 and 1982 wind energy publications. Research and development sponsored by the federal wind energy program in FY 1981 and 1982 focuses on: improving wind system designs and technologies; evaluating the performance of prototype machines; and investigating the availability and utilization of the wind resources. DOE

N84-20920# California Univ., Berkeley. Lawrence Berkeley Lab.
HIGH RESOLUTION STUDY OF THE RELATIONSHIP BETWEEN MISFIT ACCOMMODATION AND GROWTH OF Cu SUB 2-X IN CdS
T. Sands, J. Washburn, and R. Gronsky Oct. 1983 14 p refs Presented at Mater. Res. Soc. Ann. Meeting, Boston, 14 Nov. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004636; LBL-16774; CONF-831174-52) Avail: NTIS HC A02/MF A01

The growth of Cu/sub 2-x/ in the (0001) basal face of single crystal cadmium sulfide was studied with high resolution transmission electron microscopy (HRTEM) and diffraction. Cross sectional Cu/sub 2-x/S/CdS specimens and plan view Cu/sub 2-x/S separated films were prepared from heterojunctions formed by

the aqueous conversion of CdS to topotaxial Cu/sub 2-x/S. It is found that low chalcocite films form in two principal stages: (1) coalescence of low chalcocite islands; and (2) an accelerated reaction localized at pores in the Cu/sub 2-x/S film. Several possible misfit accommodation mechanisms involving twinning, cracking, and a second copper sulfide phase are identified. DOE

N84-20921# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PRELIMINARY PERFORMANCE ESTIMATES AND VALUE ANALYSES FOR BINARY GEOTHERMAL POWER PLANTS USING AMMONIA-WATER MIXTURES AS WORKING FLUIDS
C. J. Bliem Dec. 1983 28 p refs
(Contract DE-AC07-76ID-01570)
(DE84-006124; EGG-GTH-6477) Avail: NTIS HC A03/MF A01

The use of ammonia-water mixtures as working fluids in binary geothermal power generation systems is investigated. The available thermodynamic data is discussed and the methods of extrapolating this data to give the quantities needed to perform analyses of the system is given. It is indicated that for a system without a recuperator and with a working fluid which is 50% by mass of each constituent, the geofluid effectiveness is 84% of that for the 50 MW Heber Plant. The cost of generating electric power for this system was estimated to be 9% greater than for the Heber Plant. If a recuperator is incorporated in the system however, the geofluid effectiveness becomes 102% of that for the Heber Plant, and the cost of electricity is 5.25% lower because of less expensive equipment resulting from lower pressure, better heat transfer, and less working fluid to handle for the ammonia water plant. It is concluded that use of nonazeotropic mixtures of fluorocarbons as working fluids should be studied before expending further effort in the investigation of the ammonia water mixtures. DOE

N84-20922# Secord (Nelson W.), Brighton, Mich.
WECS - LOAD CONTROLLED PITCH - VARIABLE LOAD CONVERSION TO HEAT Final Report
Nelson W. Secord 26 Nov. 1983 147 p
(Grant DE-FG02-81R5-10309)
(DE84-005328; DOE/R5-10309/3) Avail: NTIS HC A07/MF A01

Load control circuitry which was developed such that excess energy from a windmill, that would normally go back to the utility, be absorbed in thermal storage to heat domestic hot water is discussed. The development of instrumentation to measure the power curve of the windmill as a function of windspeed is examined. An Enertech 4KW windmill and related equipment was used to meet this objective. DOE

N84-20923# Case Western Reserve Univ., Cleveland, Ohio.
INNOVATIVE CONCEPTS FOR PHOTOVOLTAIC APPLICATIONS Final Technical Report
Morton H. Litt and William L. Gordon Dec. 1983 4 p
(Contract DE-FG02-80CS-83114)
(DE84-005247; DOE/CS-83114/T1) Avail: NTIS HC A02/MF A01

The construction of photovoltaic devices from polymeric materials based on crystalline carbazole or acridone substituted poly(N-acyl ethyleneimines) is reported. In the carbazole case the concept was to deposit electron acceptors or a second electron accepting polymer on their surface to generate a p-n junction. Synthesis of the carbazole and acridone side chain monomers was accomplished and low molecular weight polymer prepared for both materials. The need for a plasticizer in both polymers, particularly for the carbazole polymer where T/sub g/ and T/sub m/ are very close is demonstrated. A charge transfer complex of the carbazole polymer with TCNQ was prepared, forming as a black precipitate from solution in dioxane. The dioxane is involved in the crystalline phase. The ESR shows a relatively large free spin concentration which does not take part in electrical conduction. Powder compactions show significantly better conductivity than do semicrystalline case films of the polymer alone. It is concluded that a much stronger electron donor must be used in place of the carbazole to approach the desired conductivity. DOE

N84-20924# Argonne National Lab., Ill.
SOLAR POND PERFORMANCE ESTIMATION, ENGINEERING DESIGN, AND CONSTRUCTION EXPERIENCE
John R. Hull 11 Dec. 1983 15 p refs Presented at the Royal Sci. Soc. Conf., Amman, Jordan, 9 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-003992; CONF-831252-1) Avail: NTIS HC A02/MF A01

A solar pond is a low cost solar collector and storage device for low temperature heat. There are many design and construction details that must be considered to obtain the optimum efficiencies necessary to achieve economical performance. Considerations and a brief description of mathematical models for estimating performance are discussed. DOE

N84-20925# Los Alamos Scientific Lab., N. Mex. Electronics Div.
TEST TECHNIQUES FOR MODEL DEVELOPMENT OF REPETITIVE SERVICE ENERGY STORAGE CAPACITORS
M. Clark Thompson and G. Howard Mauldin (Sandia Labs, Albuquerque, N. Mex.) 1984 8 p ref Presented at the 4th Capacitor and Resistor Tech. Symp. (CARTS '84), Orlando, Fla., 6-8 Mar. 1984
(Contract W-7405-eng-36)
(DE84-004312; LA-UR-83-3634; CONF-840367-1) Avail: NTIS HC A02/MF A01

The performance of the Sandia perfluorocarbon family of energy storage capacitors was evaluated. The capacitors have a much lower charge noise signature creating new instrumentation performance goals. Thermal response to power loading and the importance of average and spot heating in the bulk regions require technical advancements in real time temperature measurements. Reduction and interpretation of thermal data are crucial to the accurate development of an intelligent thermal transport model. The thermal model is of prime interest in the high repetition rate, high average power applications of power conditioning capacitors. The accurate identification of device parasitic parameters has ramifications in both the average power lose mechanisms and peak current delivery. Methods to determine the parasitic characteristics and their nonlinearities and terminal effects are considered. Meaningful interpretations for model development, performance history, facility development, instrumentation, plans for the future, and present data are discussed. DOE

N84-20926# Argonne National Lab., Ill.
DESIGN OF THE NEAR SHORE SEAWATER SYSTEMS FOR AN OTEC EXPANDED TEST FACILITY
L. Genens and H. Stevens 1984 4 p refs Presented at the ASME Energy Sources Tech. Conf. and Exhibition, New Orleans, 12 Feb. 1984
(Contract W-31-109-eng-38)
(DE84-004043; CONF-840201-6) Avail: NTIS HC A02/MF A01

The preparation of a design for expanded test facilities at the seacoast test facility site, Keahole Point, Hawaii is outlined, the design of the near shore/on shore seawater system is emphasized. The seawater systems consist of a warm water supply, a cold water supply, a mixed discharge, and a land based pumping station. Test facilities are planned that will utilize this thermal energy resource. This resource consists nominally of 1600 kg/s of cold water and 4200 kg/s of warm surface water, which will be used to support heat exchanger and system tests and, with a turbine added, could produce a net power for the validation of closed and open cycle models. DOE

N84-20927# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.
METEOROLOGICAL/ATMOSPHERIC EFFECTS ON THE PERFORMANCE OF SOLAR PHOTOVOLTAIC ENERGY CONVERSION DEVICES
Roland L. Hulstrom Jul. 1983 7 p refs Presented at the 5th Conf. on Atmospheric Radiation, Baltimore, 31 Oct. - 3 Nov. 1983
(Contracts DE-AC02-77CH-00178; EG-77-C-01-4042)
(DE84-000018; SERI/TP-215-2049; CONF-831069-4) Avail: NTIS HC A02/MF A01

The purpose of this paper is to highlight and summarize those meteorologic/atmospheric effects on the performance of solar photovoltaic energy conversion devices (and systems). Areas of performance considered will include the production of electricity, cost, reliability, and predictability. All of these areas, as discussed above, impact the ability of photovoltaic devices, systems, and power plants to eventually become a significant source of electricity for the United States. In addition, this paper will identify the pertinent meteorologic, atmospheric, and solar radiation data required to ensure the proper research, development, design, application, and operation of photovoltaic devices, systems, and power plants. DOE

N84-20928# Midwest Research Inst., Golden, Colo. Thermal Research Branch.
AIR/MOLTEN SALT DIRECT-CONTACT HEAT-TRANSFER EXPERIMENT AND ECONOMIC ANALYSIS
Mark S. Bohn Nov. 1983 60 p refs
(Contract DE-AC02-83CH-10093)
(DE84-000080; SERI/TR-252-2015) Avail: NTIS HC A04/MF A01

Direct-contact heat-transfer coefficients have been measured in a pilot-scale packed column heat exchanger for molten salt/air duty. Two types of commercial tower packings were tested: metal Raschig rings and initial Pall rings. Volumetric heat-transfer coefficients were measured and appeared to depend upon air flow but not on salt flow rate. An economic analysis was used to compare the cost-effectiveness of direct-contact heat exchange with finned-tube heat exchanger in this application. Incorporating the measured volumetric heat-transfer coefficients, a direct-contact system appeared to be from two to five times as cost-effective as a finned-tube heat exchanger, depending upon operating temperature. The large cost advantage occurs for higher operating temperatures (2700(0)C), where high rates of heat transfer and flexibility in materials choice give the cost advantage to the direct-contact heat exchanger. DOE

N84-20929# Midwest Research Inst., Golden, Colo. Materials Research Branch.
ACTIVE SOLAR HEATING AND COOLING PROGRAM. POLYMER STABILIZATION FILM-FORMING, HIGH-TEMPERATURE POLYMERS Annual Progress Report, 1 Oct. 1982 - 30 Sep. 1983
Paul Schissel and H. H. Neidlinger Dec. 1983 25 p refs
(Contract DE-AC02-83CH-10093)
(DE84-000093; SERI/PR-255-2168) Avail: NTIS HC A02/MF A01

Assessment of the performance of polymeric films at elevated temperatures under solar exposure conditions is made difficult because little comparative test data exists. Answers are needed to the following questions: (1) what are the changes in physical properties over a wide temperature range, i.e., what is the physical temperature stability and what is the effect of long-term exposure to high temperature, ultraviolet (UV) light, and different environmental conditions; i.e., what is the chemical temperature stability. The present report summarizes literature data for some higher temperature polymers. Film brittleness and other mechanical factors are considered but are not necessarily reasons for rejection in this initial sorting process. Materials that form films are listed in two categories. When data indicate that transparent films can be made, this is emphasized in the first category even though the films may be colored. DOE

N84-20930# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
DESIGN AND DEVELOPMENT OF A STAND-ALONE CONCENTRATOR PHOTOVOLTAIC ARRAY Final Report
Nov. 1983 135 p
(Contract DE-AC04-76DP-00789)
(DE84-005860; SAND-82-7131) Avail: NTIS HC A07/MF A01

The design and development of a new Stand-Alone concentrating photovoltaic array is described. Array sizing, tracking structure and control have been tailored for use in semi-remote non-grid connected applications. A new tracking approach has been developed that uses commerically available components, can be transported by small truck or trailer, and can be erected by two semi-skilled workers. The 684 watt array incorporates six 114 watt point-focus, flat Fresnel modules. Array level testing at GE has demonstrated an average array efficiency of 14% at direct normal insolations between 727 to 776 w/m(2) normalized to a 280C cell temperature. DOE

N84-20931# Institute of Gas Technology, Chicago, Ill.
BIOTHERMAL CONVERSION OF BIOMASS AND WASTES TO METHANE
David P. Chynoweth and Vipul J. Srivastava 1983 39 p refs Presented at the 5th Symp. on Biotechnol. for Fuels and Chem., Gatlinburg, Tenn., 10-13 May 1983
(Contract W-7405-eng-26)
(DE84-006052; CONF-830567-6) Avail: NTIS HC A03/MF A01

This paper describes the BIOTHERMGAS process for conversion of biomass and wastes to substitute natural gas (SNG) and/or medium-Btu gas. This process combines biological and thermochemical unit operations into a scheme that can efficiency convert the full spectrum of biomass or waste feedstocks (regardless of moisture and nutrient contents) to methane or other fuel products with minimum process residues. The BIOTHERMGAS process employs biogasification followed by thermochemical gasification of dewatered refractory digester residues. Nitrogen and other inorganic nutrients are recycled from the thermal process effluent to the biogasification unit. The product gas from the thermochemical gasifier can be converted to methane either by catalytic methanation or by biomethanation. The waste heat from thermal product gases is used to supply the heat requirement of the bioconversion component. The preliminary systems analyses were conducted on five applications of the BIOTHERMGAS process: three using biomass (Bermuda grass) and two using municipal wastes as feedstocks. DOE

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N84-20932# Pacific Northwest Lab., Richland, Wash.
POTENTIAL TRANSPORT ERRORS IN SINGLE-LAYER WIND FIELDS
C. Berkowitz, W. E. Davis (Argonne National Lab., Ill.), and D. Knudson 1983 12 p refs Presented at Intern. Specialty Conf. on the Meteorology of Acidic Deposition, Hartford, Conn., 16 Oct. 1983
(Contract W-31-109-eng-38)
(DE84-003446; CONF-8310220-3) Avail: NTIS HC A02/MF A01

An integral part of acid deposition modeling involves tracking the location of air parcels from source to receptor areas. Although a variety of trajectory computation methods may be used, all models must rely on meteorological data as a basis input. Potential errors in using wind data to represent transport of parcels include shear induced changes in wind velocity with height. Potential errors associated with using single layer average winds as opposed to multilayer average values in trajectory simulations were analyzed. Wind fields from four distinct layers and a single layer average value using data from seven upper air stations in the eastern US. Statistics generated from these data provide insight to the deviation from use of the individual versus single layer averages and the representativesness of the column value are compared. It is indicated that although extreme differences can occur, over a reasonable period of time shear induced errors in trajectory calculations should cancel. DOE

N84-20933# Oak Ridge National Lab., Tenn.
FORAST: A REGIONAL SCALE STUDY OF FOREST RESPONSES TO AIR POLLUTANTS
S. B. McLaughlin 1983 12 p refs Presented at the Symp. on

Air Pollution and the Productivity of the Forest, Washington, D.C., 4 Oct. 1983
(Contract W-7405-eng-26)
(DE84-003269; CONF-8310240-3) Avail: NTIS HC A02/MF A01

The forest responses to anthropogenic stress (FORAST) study was initiated to quantify long term changes in forest growth and determine the temporal and spatial association of these changes with indices of stress from gaseous pollutants (primarily 03) and acid rainfall. This broadly collaborative project presently involves 12 research sites utilizing a common research plan. Duplicate cores were removed from approximately 6000 forest trees representing 34 species and 88 forest stands and distributed over 15 eastern states. Approximately 95% of the field sampling is completed and analysis of cores is underway. Both potentially acid sensitive and acid resistant sites are included in the sampling protocol. Multivariate statistical analysis of annual growth trends will be used to quantify primary influences on annual growth as measured from increment cores. These variables include climatic variables, oxidant pollution levels, trends in acid deposition, and site factors, including both stand density and soil chemical characteristics. The project focuses on development of methods to systematically examine regional growth patterns, determine if changes are occurring which are correlated with acid rainfall and associated anthropogenic stress, and identify both the need and the methodology for further more intensive analyses. DOE

N84-20934# Department of Energy, Washington, D. C. Office of Basic Energy Sciences.
VEGETATION RESPONSE TO CARBON DIOXIDE RESEARCH PLAN
Roger C. Dahlman Jan. 1984 35 p refs
(DE84-006219; DOE/ER-0187) Avail: NTIS HC A03/MF A01

The goal of the program is to acquire the knowledge base for addressing government policies related to effects of increasing atmospheric CO2. This research plan identifies information needed to reduce uncertainties about crop and ecosystem responses to CO2. This information will be used for balanced assessments of long-range environmental consequences of a higher CO2 world. This research plan will develop the ability to predict crop and ecosystem responses to elevated levels of CO2. Principal objectives are (1) to determine fundamental effects of long-term, elevated CO2 exposure on plant physiology and growth: (2) to determine yield of major crops in relation to more CO2; and (3) to evaluate ecosystem responses in terms of productivity, altered composition of plant communities and carbon change from CO2 enhancement of growth. Integrated approaches for achieving the plan's objectives require acquisition of laboratory and field data on the effects of CO2 on plant physiology and growth. Simultaneously, models will be developed for predicting responses directly related to CO2 as well as to the combined effects of CO2 and other environmental variables affecting plant growth. DOE

N84-20935# Argonne National Lab., Ill. Energy and Environmental Systems Div.
METEOROLOGICALLY INDUCED UNCERTAINTY IN LRT MODELING
Duane A. Knudson and Jack D. Shannon 1983 8 p refs Presented at the Intern. Specialty Conf. on the Meteorol. of Acidic Deposition, Hartford, Conn., 16 Oct. 1983
(Contract W-31-109-eng-38)
(DE84-003444; CONF-8310220-2) Avail: NTIS HC A02/MF A01

Meteorological conditions which control atmospheric transport and deposition may exhibit large annual variability. A preliminary indication of potential annual variability is presented. Meteorological data for two consecutive years are examined through use of the Advanced Statistical Trajectory Regional Air Pollution (ASTRAP) model for a group of source/receptor combinations in eastern North America. Source/receptor distances range from about 400 through 1200 km, with receptors generally in the northeast quadrant of sources. It is indicated that seasonal percentage differences for total deposition between the 2 years for particular source/receptor combinations are as high as 80 to 100%. For most source/receptor combinations, however, differences are much lower. It is found that there is a slight seasonal tendency for wet deposition to be most variable during the summer season and no apparent seasonal pattern for dry deposition variability. DOE

N84-20936# California Univ., Livermore. Lawrence Livermore Lab.
PRELIMINARY REPORT ON THE GLOBAL TRANSPORT MODEL GRANTOUR
John J. Walton and M. C. MacCracken Jan. 1984 27 p refs
(Contract W-7405-eng-48)
(DE84-005596; UCID-19985) Avail: NTIS HC A03/MF A01

A two dimensional trace species transport model (GRANTOUR) that is driven by windfields generated by the Oregon State General Circulation Model (GCM) is described. The code uses constant mass air particles referred to as lagrangian sampling parcels (LSP) that are advected by prescribed windfields. Each parcel consists of a vertical column having one surface level and three atmospheric levels and contains up to five constituents, presently four particle size ranges and one gaseous trace species. Vertical processes such as particle settling, convection, rainout and deposition take place within each parcel. Diffusion between parcels may also be prescribed. There may also be sources and sinks driving concentrations in the parcels. The manner in which the various processes are implemented by the LSP method is reported and sample calculations are presented. DOE

N84-20937# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environmental Div.
ATMOSPHERIC AEROSOL RESEARCH FOR FY 82
Tihomir Novakov Jul. 1983 30 p refs
(Contract DE-AC03-76SF-00098)
(DE84-004308; LBL-15298(Excerpt)) Avail: NTIS HC A03/MF A01

Research on the chemistry and measurement of atmospheric aerosols is reported. Separate abstracts are prepared for the 10 articles presented. DOE

N84-20938# Mound Lab., Miamisburg, Ohio.
MA-2026 ENVIRONMENTAL MONITORING SYSTEM
Elias Spyrou 27 Jan. 1984 17 p
(Contract DE-AC04-76DP-00053)
(DE84-006222; MLM-3130) Avail: NTIS HC A02/MF A01

The MA-2026 EMS (Environmental Monitoring System) is a transportable system that has the capability to acquire and accumulate environmental information with respect to real time, in a pseudo intrinsically safe environment. The MA-2026 EMS manipulates the accumulated information from its various sensors and converts it into engineering units; then it either displays that information in real time or saves it on permanent records such as cassette tape for future analysis. The MA-2026 system was designed to aid in the analysis of the effect of the environment on various developmental as well as manufacturing processes at Mound. DOE

N84-20939# Environmental Protection Agency, Research Triangle Park, N.C. Office of Air Quality Planning and Standards.
PROGRESS IN THE PREVENTION AND CONTROL OF AIR POLLUTION IN 1980 AND 1981 Final Annual Report
Oct. 1983 57 p
(PB84-126788) Avail: NTIS HC A04/MF A01 CSCL 13B

The report addresses the progress made in the prevention and control of air pollution in 1980 and 1981. It covers the areas of air quality trends and monitoring, development of air quality criteria and standards, the status of State Implementation Plans, the control of stationary and mobile source emissions, enforcement, and litigation. The report is the annual report of the Administrator of EPA to the Congress in compliance with Sections 313,202(b)(4), and 306 of the Clean Air Act, as amended. GRA

N84-20940# Environmental Protection Agency, Research Triangle Park, N.C. Environmental Sciences Research Lab.
RELATION OF URBAN MODEL PERFORMANCE TO STABILITY

D. Bruce Turner and John S. Irwin 1983 18 p refs
(PB84-130418; EPA-600/D-84-025) Avail: NTIS HC A02/MF A01 CSCL 13B

The RAM model performance in estimating SO2 concentrations in St. Louis, MO for 1976 has been discussed in several previous papers by the authors. In these studies the model estimates were compared to the observed concentrations of SO2 at 13 sites in the St. Louis metropolitan area. An analysis is made evaluating the RAM model performance in estimating the infrequently occurring high concentration values. Previous comparisons have been criticized for not assuring that the modeled high concentration values occurred during similar meteorological conditions as when the high concentration values occurred during similar meteorological conditions as when the high concentrations were observed. To address these concerns, the data are sorted by stability class and wind speed before the comparison statistics are computed. GRA

N84-20941# Environmental Protection Agency, Washington, D.C. Office of Administration.
ACID RAIN BIBLIOGRAPHY
Sep. 1983 429 p
(PB84-138940; EPA-830/83-022) Avail: NTIS HC A19/MF A01 CSCL 13B

This bibliography identifies 900 citations on various aspects of Acid Rain, covering published bibliographies, books, reports, conference and symposium proceedings, audio visual materials, pamphlets and newsletters. It includes five sections: Citations Index (complete record of author, title, source, under number); KWIC Index (Key Word In Context); Title Index; Author Index; and Source Index. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation.*

N84-20942 Minnesota Univ., Minneapolis.
THE STUDY OF A MASS SPECTROMETER-BEAM SYSTEM FOR MEASUREMENTS OF OZONE AND OTHER MINOR CONSTITUENTS OF THE STRATOSPHERE Ph.D. Thesis
Stuart Mitchell Anderson 1983 108 p
Avail: Univ. Microfilms Order No. DA8329493

According to current models the earliest signs of a depletion in stratospheric ozone due to the combined effects of CO2, NOx, CLx, and HOx should be observable in the upper stratosphere. Recently an experiment capable of precise high altitude measurements of ozone and other important species has been developed. The experiment combines a mass spectrometer with a molecular beam pressure reduction system. Laboratory apparatus which allows extensive simulation of flight conditions together with high accuracy ozone calibrations has been constructed. This apparatus is used to study the characteristics of the molecular beam sampling technique and to evaluate the performance of the ozone calibration facility. It is found that there are species-dependent mechanisms inherent in the formation of the molecular beam which, if ignored, could produce erroneous vertical profiles of stratospheric constituents. The dominant processes are pressure diffusion and scattering due to background gas. Dissert. Abstr.

N84-20943 Hawaii Univ., Honolulu.
SEAMOUNT PALEOMAGNETISM AND PACIFIC PLATE TECTONICS Ph.D. Thesis
William Warren Sager 1983 489 p
Avail: Univ. Microfilms Order No. DA8401337

Thirty-four new seamount paleomagnetic models are presented in this study, doubling the amount of reliable seamount paleomagnetic data available from the Pacific, making it possible to re-interpret the apparent polar wander path (APWP) of the Pacific and to examine the temporal distribution of volcanism in the Line Islands and Musicians Seamounts. Paleomagnetic results from twenty-six dated seamounts were combined with Pacific paleomagnetic data from other sources to calculate seven mean paleomagnetic poles representing the Eocene, Maastrichtian, Campanian, Santonian, Turoian, Albian, and Barremian. The agreement of the seamount VGPs with the other paleomagnetic data is generally quite good, indicating that the seamount results are relatively free of any bias that might result from demagnetization or secondary magnetization components. The APWP begins near Greenland along the Late Jurassic DSDP Site 307 polar circle and moves more than 20 deg southward to the Barremian and Albian poles. Dissert. Abstr.

N84-20944# Geological Survey, Washington, D. C.
THE MARINE GEOLOGY PROGRAM OF THE US GEOLOGICAL SURVEY
N. Terence Edgar 1983 27 p refs
(USGS-Circ-906) Avail: NTIS HC A03/MF A01

The U.S. Geological Survey and charged it with the responsibility for the classification of public lands and examination of the geologic structure, mineral resources and products of the national domain. The national domain for seabed resources was extended to 200 nautical miles offshore. This United States Exclusive Economic Zone (EEZ), a marine domain surrounding the continental U.S., Hawaii, and U.S. related islands, constitutes an area about one and two thirds larger than the size of the onshore area. In this vast domain lie resources of immense importance to the Nation: an estimated 35 percent of the economically recoverable oil and gas yet to be found in the United States; major resources of strategic metals like cobalt, manganese, and nickel in seafloor crusts, pavements, and modules; massive sulfide deposits actively forming today; and major concentrations of heavy minerals in nearshore sand bodies. Author

N84-20945# Geological Survey, Washington, D. C.
EARTHQUAKES IN THE UNITED STATES, JANUARY - MARCH 1982
C. W. Stover, J. H. Minsch, B. G. Reagor, and F. W. Baldwin 1982 47 p refs
(USGS-Circ-896-A) Avail: NTIS HC A03/MF A01

The earthquake information supplements that published by the U.S. Geological Survey (USGS) in the National Earthquake Information Service (NELS) publications PDE (Preliminary Determination of Epicenters) and Preliminary Determination of Epicenters Monthly Listing, by providing detailed felt and intensity data for U.S. earthquakes. This circular is to provide a complete listing of macroseismic effects of earthquakes, which is used in risk studies, nuclear power plant site evaluations, seismicity studies, and to answer inquiries by the public. Author

N84-20946*# Johns Hopkins Univ., Baltimore, Md. Dept. of Earth and Planetary Sciences.
PETROLOGIC AND GEOPHYSICAL STUDY OF THE SOURCE OF LONG WAVELENGTH CRUSTAL MAGNETIC ANOMALIES Final Report, 1 May 1979 - 31 May 1980
Bruce Marsch and Charles Schlinger (Utah Univ.) 26 Sep. 1983 19 p refs
(Grant NCC5-13)
(NASA-CR-175168; NAS 1.26:175168) Avail: NTIS HC A02/MF A01 CSCL 08N

The magnetic mineralogy and magnetic signature of banded ion formations, diagenetic (unmetamorphosed) and low grade banded iron formations, high-grade mineralogy, and phase equilibria of magnetite inorogenic magmers are discussed. N.W.

N84-20947*# Lunar and Planetary Inst., Houston, Tex.
WORKSHOP ON A CROSS SECTION OF ARCHEAN CRUST
L. D. Ashwal, ed. and K. D. Card, ed. (Geological Survey of Canada) 1983 176 p refs
(Contract NASw-3389)
(NASA-CR-175451; NAS 1.26:175451; LPI-TR-83-03) Avail: NTIS HC A09/MF A01 CSCL 08G

Various topics relevant to crustal genesis, especially the relationship between Archean low - and high-grade terrains, were discussed. The central Superior Province of the Canadian Shield was studied. Here a 120 km-wide transition from subgreenschist facies rocks of the Michipicoten greenstone belt to granulite facies rocks of the Kapuskasing structural zone represents an oblique cross section through some 20 km of crust, uplifted along a northwest-dipping thrust fault. For individual titles, see N84-20948 through N84-20969.

N84-20948*# Lunar and Planetary Inst., Houston, Tex.
THERMAL CONTRAINTS ON HIGH-PRESSURE GRANULITE METAMORPHISM OF SUPRACRUSTAL ROCKS Abstract Only
Lewis D. Ashwal, P. Morgan, and W. W. Leslie *In its* Workshop on a Cross Section of Archean Crust 1983 p 13-19 (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The circumstances leading to the formation and exposure at the Earth's surface of supracrustal granulites are examined. These are defined as sediments, volcanics, and other rock units which originally formed at the surface of the Earth, were metamorphosed to high-pressure granulite facies (T = 700-900 C, P = 5-10 kbar), and reexposed at the Earth's surface, in many cases underlain by normal thicknesses of continental crust (30-40 km). Five possible heating mechanisms to account for granulite metamorphism of supracrustal rocks are discussed: magnetic heating, thermal relaxation of perturbed temperature profiles following underthrusting of the continental crust, thermal relaxation after underthrusting of thin slivers of supracrustal rocks below continental crust of normal thickness, major preheating of the upper plate, and shear heating caused by frictional stress along the thrust plane. R.J.F.

N84-20949*# State Univ. of New York, Albany.
IS THE KAPUSKASING STRUCTURE THE SITE OF A CRYPTIC SUTURE Abstract Only
Kevin Burke *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 20-23 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The demonstration that the Kapuskasing structure involves substantial thrusting of deep continental crustal rocks over shallower continental rocks calls into question an earlier suggestion (by Wilson) that the Circum-Ungaua suture zone continued through the Kapuskasing to join the Penokean fold belt (implying that the Kapuskasing marked the site of what has since come to be called a cryptic suture). Problems are discussed which arose in attempting to reconcile Wilson's idea with data from more recent studies: whether the Kapuskasing and the Thompson belt both mark sutures of about 1700 Ma age; why there is no age difference across the Kapuskasing if it does mark the site of continental collision, and why there is no offset of Superior subprovinces across the Kapuskasing. R.J.F.

N84-20950*# Carnegie Institution of Washington, D. C. Dept. of Terrestrial Magnetism.
Sm-Nd ISOTOPIC SYSTEMATICS OF THE ANCIENT GNEISS COMPLEX, SOUTHERN AFRICA Abstract Only
Richard W. Carlson, D. R. Hunter (Natal Univ.), and F. Barker (Geological Survey, Anchorage, Alaska) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 24-27 (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

In order to shed some new light on the question of the absolute and relative ages of the Ancient Gneiss Complex and Onverwacht Group, a Sm-Nd whole-rock and mineral isochron study of the AGC was begun. At this point, the whole-rock study of samples from the Bimodal Suite selected from those studied for their geochemical characteristics by Hunter et al., is completed. These results and their implications for the chronologic evolution of the Kaapvaal craton and the sources of these ancient rocks are discussed. R.J.F.

N84-20951*# Australian National Univ., Canberra. Research School of Earth Sciences.
ION MICROPROBE ZIRCON GEOCHRONOLOGY OF THE UIVAK GNEISSES: IMPLICATIONS FOR THE EVOLUTION OF EARLY TERRESTRIAL CRUST IN THE NORTH ATLANTIC CRATON Abstract Only
Kenneth D. Collerson *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 28-33 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Ion microprobe U-Pb results for zircons from three Uivak I gneisses and one specimen of Uivak II gneiss, from the Saglek-Hebron area of Northern Labrador are reported. These results are compared with interpretations based on published conventional U-Pb zircon results and with conclusions about crustal evolution in the NAC derived from Rb-Sr, Sm-Nd and Pb-Pb isotopic studies. R.J.F.

N84-20952*# New Mexico Inst. of Mining and Technology, Socorro. Dept. of Geoscience.
THE TRANSITION FROM AN ARCHEAN GRANITE-GREENSTONE TERRAIN INTO A CHARNOCKITE TERRAIN IN SOUTHERN INDIA Abstract Only
Kent C. Condie and Philip Allen *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 34-37 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

In southern India, it is possible to study the transition from an Archean granite-greenstone terrain (the Karnataka province) into high grade charnockites. The transition occurs over an outcrop width of 20-35 km and appears to represent burial depths ranging from 15 to 20 km. Field and geochemical studies indicate that the charnockites developed at the expense of tonalites, granites, and greenstones. South of the transition zone, geobarometer studies indicate burial depths of 7-9 kb. R.J.F.

N84-20953*# Harvard Univ., Cambridge, Mass. Dept. of Geological Science.
AVERAGE SEDIMENTARY ROCK RARE EARTH ELEMENT PATTERNS AND CRUSTAL EVOLUTION: SOME OBSERVATIONS AND IMPLICATIONS FROM THE 3800 Ma ISUA SUPRACRUSTAL BELT, WEST GREENLAND Abstract Only
R. F. Dymek, J. L. Boak (Arco), and L. P. Gromet (Brown Univ.) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 38-41 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Rare earth element (REE) data is given on a set of clastic metasediments from the 3800 Ma Isua Supracrustal belt, West Greenland. Each of two units from the same sedimentary sequence has a distinctive REE pattern, but the average of these rocks bears a very strong resemblance to the REE pattern for the North American Shale Composite (NASC), and departs considerably from previous estimates of REE patterns in Archaean sediments. The possibility that the source area for the Isua sediments resembled that of the NASC is regarded as highly unlikely. However, REE patterns like that in the NASC may be produced by sedimentary recycling of material yielding patterns such as are found at Isua. The results lead to the following tentative conclusions: (1) The REE patterns for Isua Seq. B MBG indicate the existence of crustal materials with fractionated REE and negative Eu anomalies at 3800 Ma, (2) The average Seq. B REE pattern resembles that of the North American Shale Composite (NASC), (3) If the Seq. B average is truly representative of its crustal sources, then this early crust could have been extensively differentiated. In this regard, a proper understanding of the NASC pattern, and its relationship to post-Archaean crustal REE reservoirs, is essential, (4) The Isua results may represent a local effect. R.J.F.

N84-20954*# Toronto Univ. (Ontario). Dept. of Geology.
STRUCTURAL VARIATION OF PROTEROZOIC DIKES IN CENTRAL SUPERIOR PROVINCE: A POSSIBLE REFLECTION OF POST-ARCHEAN SHIELD DEFORMATION Abstract Only

Richard E. Ernst *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 42-46 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Preliminary work is reported on the use of two structural parameters, dike dip and thickness, as possible depth-of-exposure indicators in the Central Superior Province. The data demonstrate systematic variations in the dip and thickness of 2.6 and 1.14 Ga. dikes across the Central Superior Province and are tentatively interpreted to result from post intrusion deformation. Combination of these results with additional structural and paleomagnetic data from dikes of all gas may permit detailed mapping both spatially and temporally of crustal deformation in this part of the Canadian Shield. Although dike dip and thickness data apparently reflect crustal exposure level as given by host rock metamorphic grade (ranging from subgreenschist to granulite), these post-orogenic dikes themselves are at most only weakly metamorphosed. This requires that regional isotherms dropped dramatically after the Kenoran orogeny (2.65 Ga.) and prior to emplacement of the earlist post-orogenic swarm (Matachewan-Hearst) at 2.6 Ga. R.J.F.

N84-20955*# Wyoming Univ., Laramie. Dept. of Geology and Geophysics.
GEOPHYSICAL CONSEQUENCES OF PHANEROZOIC AND ARCHEAN CRUSTAL EVOLUTION: EVIDENCE FROM CRUSTAL CROSS-SECTIONS Abstract Only
David M. Fountain *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 47-50 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Geophysical properties of continental crust depend on the nature of crustal evolution. This is well illustrated by examination of two crustal cross-sections (1), the combined Ivrea-Verbano zone (IVZ) and Strona-Ceneri zone (SCZ) of northern Italy and the Pikwitonei granulite belt (PGB) and Cross Lake subprovince (CLS) of Manitoba. These two cross-sections are of particular interest because the IVZ and SCZ developed during Phanerozoic time whereas the PGB-CLS is an example of Archean crustal evolution. Consequently, each cross-section is geologically distinctive and, thus, exhibits very different geophysical properties such as density, seismic velocity, heat production, and magnetism. Results of geological investigations of each area are given. R.J.F.

N84-20956*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
USE OF OLIVINE AND PLAGIOCLASE SATURATION SURFACES FOR THE PETROGENETIC MODELING OF RECRYSTALLIZED BASIC PLUTONIC SYSTEMS Abstract Only
Gilbert N. Hanson *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 51 (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

During petrogenetic studies of basic plutonic rocks, there are at least three major questions to be considered: (1) what were the relative proportions of cumulate crystals and intercumulus melt in a given sample? (2) what is the composition and variation in composition of the melts within the pluton? and (3) what is the original composition of the liquids, their source and evolution prior to the time of emplacement? Use of both saturation surfaces can place strong limits on the compositions of potential cumulate phases and intercumulus melts. Consideration of appropriate trace elements can indicate whether a sample is an orthocumulate, adcumulate or mesocumulate. Thus, when trace element and petrographic data are considered together with the saturation surfaces, it should be possible to begin to answer the three major questions given above, even for strongly recrystallized basic plutons. R.J.F.

N84-20957*# Scripps Institution of Oceanography, La Jolla, Calif.
AN ANCIENT DEPLETED MANTLE SOURCE FOR ARCHEAN CRUST IN RAJASTHAN, INDIA Abstract Only
J. D. Macdougall, K. Gopalan (Physical Research Lab., Ahmedabad, India), G. W. Lugmair, and A. B. Roy (Rajasthan Univ.) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 55-56 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Data from an initial set of Banded Gneiss Complex (BGC) east of the city of Udaipur are given. In this region the BGC comprises typical grey gneiss with variably abundant granitic and mafic components. Efforts to date were concentrated on the mafic components which, based on chemical data, appear to be metavolcanic. All samples examined were recrystallized under amphibolite or upper amphibolite facies conditions. Pertinent chemical data for a small number of amphibolites analyzed so far are: SiO_2: 49-53%; MgO: 5.7-7.3%; K_2O: 0.24-0.50%; Ni: 106-140 ppm; Zr: 37-159 ppm. From Sm/Nd data, all amphibolites show small to moderate LREE enrichments. R.J.F.

N84-20958*# Massachusetts Univ., Amherst. Dept. of Geology and Geography.
VENUS TOPOGRAPHY: CLUE TO HOT-LITHOSPHERE TECTONICS? Abstract Only
George E. Mcgill *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 57-60 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The topography of Venus is studied in order to learn about hot lithosphere tectonic processes of Archean Earth. Except for the difference in H_2O abundances (Archaen Earth was wet; modern Venus is very dry), linear zones on Venus may be analogous to the tectonic settings for some Archean greenstone belts. R.J.F.

N84-20959*# Florida Univ., Gainesville. Dept. of Geology.
DEVELOPMENT OF THE EARTH'S EARLY CRUST: IMPLICATIONS FROM THE BEARTOOTH MOUNTAINS Abstract Only
Paul A. Mueller, J. L. Wooden (Lunar and Planetary Inst.), Darrell J. Henry (Lunar and Planetary Inst.), and D. W. Mogk (Montana State Univ., Bozeman) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 61-65 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The Beartooth Mountains of Montana and Wyoming are one of several major uplifts of Precambrian rocks in the northwestern of the Wyoming Province. The range is composed of a wide variety of rock types which record a complex geologic history that extends from early (> 3400 Ma) to late (approx 700 Ma) Precambrian time. The Archean geology of the range is complex and many areas remain unstudied in detail. In this discussion two areas are discussed for which there is considerable structural, geochemical and petrologic information. The easternmost portion of the range (EBT) and the northwesternmost portion, the North Snowy Block (NSB), contain rather extensive records of both early and late Archean geologic activity. These data are used to constrain a petrologic tectonic model for the development of continental crust in this area. B.W.

N84-20960*# Minnesota Univ., Duluth. Dept. of Geology.
CLASTIC SEDIMENTARY ROCKS OF THE MICHIPICOTEN VOLCANIC-SEDIMENTARY BELT, WAWA, ONTARIO Abstract Only
Richard W. Ojakangas *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 66-70 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The Wawa area, part of the Michipicoten greenstone belt, contains rock assemblages representative of volcanic sedimentary accumulations elsewhere on the shield. Three mafic to felsic metavolcanic sequences and cogenetic granitic rocks range in age from 2749 + or - 2Ma to 2696 + or - 2Ma. Metasedimentary rocks occur between the metavolcanic sequences. The total thickness of the supracrustal rocks may be 10,000 m. Most rocks have been metamorphosed under greenschist conditions. The belt has been studied earlier and is currently being remapped by Sage. The sedimentrologic work has been briefly summarized; two mainfacies associations of clastic sedimentary rocks are present -

a Resedimented (Turbidite) Facies Association and a Nonmarine (Alluvial Fan Fluvial) Facies Association. B.W.

N84-20961*# Max-Planck-Institut fuer Chemie, Mainz (West Germany). Abt. Kosmochemie.
A MULTI-ELEMENT STUDY OF ISUA IRON-FORMATION, W-GREENLAND Abstract Only
Ullrich Rast *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 71-75 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Meta-sediments from Isua, West Greenland were analyzed by instrumental thermal neutron activation analysis (ITNAA). These sediments are chemical precipitates having some layers of remarkably high Cr content. The latter were compared to Cr poor layers. It turned out that the Cr enriched layers had higher Ir and Ni contents than the samples from the Cr poor layers. Compared to phanerozoic samples the highest Ir contents are not extraordinarily higher than in a modern sediment, and the Cr poor layers, representing more or less phanerozoic shale. From the cratering record of the Moon one can assume a similar cratering of the Earth at about the time when the Isua rocks were formed. B.W.

N84-20962*# Lunar and Planetary Inst., Houston, Tex.
METAMORPHIC FLUIDS AND UPLIFT-EROSION HISTORY OF A PORTION OF THE KAPUSKASING STRUCTURAL ZONE, ONTARIO, AS DEDUCED FROM FLUID INCLUSIONS Abstract Only
Roberta L. Rudnick, Lewis D. Ashwal, and D. J. Henry *In its* Workshop on A Cross Section of Archean Crust 1983 p 76-80 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Fluid inclusions can be used to determine the compositional evolution of fluids present in high grade metamorphic rocks (Touret, 1979) along with the general P-T path followed by the rocks during uplift and erosion (Hollister et al., 1979). In this context, samples of high grade gneisses from the Kapuskasing structural zone (KSZ, Fig. 1) of eastern Ontario were studied in an attempt to define the composition of syn- and post-metamorphic fluids and help constrain the uplift and erosion history of the KSZ. Recent work by Percival (1980), Percival and Card (1983) and Percival and Krogh (1983) shows that the KSZ represents lower crustal granulites that form the lower portion of an oblique cross section through the Archean crust, which was up faulted along a northeast striking thrust fault. The present fluid inclusion study places constraints upon the P-T path which the KSZ followed during uplift and erosion. Author

N84-20963*# Geological Survey, Reston, Va.
GEOCHEMISTRY OF VOLCANIC ROCKS FROM THE WAWA GREENSTONE BELT Abstract Only
Klaus J. Schulz, Paul J. Sylvester (Washington Univ., St. Louis), and K. Attoh (Hope College) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 81-82 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The Wawa greenstone belt is located in the District of Algoma and extends east-northeast from Lake Superior to the western part of the Sudbury District in Ontario, Canada. Recent mapping by Attoh has shown that an unconformity at the base of the Dore' Formation and equivalent sedimentary rocks marks a significant stratigraphic break which can be traced throughout the volcanic belt. This break has been used to subdivide the volcanic-sedimentary into pre- and post-Dore' sequences. The pre-Dore' sequence includes at least two cycles of mafic-to-felsic volcanism, each capped by an iron-formation unit. The post-Dore' sequence includes an older mafic-to-felsic unit, which directly overlies sedimentary rocks correlated with the Dore' Formation, and a younger felsic breccia unit interpreted to have formed as debris flows from a felsic volcanic center. In the present study, samples of both the pre-and post-Dore' volcanic sequences were analyzed for major and trace elements, incuding rare earths (REE). This preliminary study is part of an ongoing program to assess the petrogenesis of the volcanic rocks of the Wawa greenstone belt. Author

N84-20964*# State Univ. of New York, Stony Brook. Dept. of Earth and Space Sciences.
GRANITIC ROCKS AND METASEDIMENTS IN ARCHEAN CRUST, RAINY LAKE AREA, ONTARIO: AND ISOTOPE EVIDENCE FOR MANTLE-LIKE SM/ND SOURCES Abstract Only
Steven B. Shirey and Gilbert N. Hanson *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 83-86 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Granitoids, felsic volcanic rocks and clastic metasediments are typical rocks in Archean granite-greenstone belts that could have formed from preexisting continentasl crust. The petrogenesis of such rocks is assessed to determine the relative roles of new crust formation or old crust formation or old crust recycling in the formation of granite-greenstone belts. B.W.

N84-20965*# Australian National Univ., Canberra. Research School of Earth Sciences.
CONTINENTAL CRUSTAL COMPOSITION AND LOWER CRUSTAL MODELS Abstract Only
S. Ross Taylor *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 87-91 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The composition of the upper crust is well established as being close to that of granodiorite. The upper crustal composition is reflected in the uniform REE abundances in shales which represent an homogenization of the various REE patterns. This composition can only persist to depths of 10-15 km, for heat flow and geochemical balance reasons. The composition of the total crust is model dependent. One constraint is that it should be capable of generating the upper granodioritic (S.L.) crust by partial melting within the crust. This composition is based on the andesite model, which assumes that the total crust has grown by accretion of island arc material. A representation of the growth rate of the continental crust is shown. The composition of the lower crust, which comprises 60-80% of the continental crust, remains a major unknown factor for models of terrestrial crustal evolution. Two approaches are used to model the lower crust. B.W.

N84-20966*# California Univ., Santa Barbara. Dept. of Geological Sciences.
ARCHEAN CRUST-MANTLE GEOCHEMICAL DIFFERENTIATION Abstract Only
George R. Tilton *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 92-94 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

Isotope measurements on carbonatite complexes and komatiites can provide information on the geochemical character and geochemical evolution of the mantle, including the sub-continental mantle. Measurements on young samples establish the validity of the method. These are based on Sr, Nd and Pb data from the Tertiary-Mesozoic Gorgona komatiite and Sr and Pb data from the Cretaceous Oka carbonatite complex. In both cases the data describe a LIL element-depleted source similar to that observed presently in MORB. Carbonatite data have been used to study the mantle beneath the Superior Province of the Canadian Shield one billion years (1 AE) ago. The framework for this investigation was established by Bell et al., who showed that large areas of the province appear to be underlain by LIL element-depleted mantle ($Sr\text{-}85/Sr\text{-}86 = 0.7028$) at 1 AE ago. Additionally Bell et al. found four complexes to have higher initial Sr ratios ($Sr\text{-}87/Sr\text{-}86 = 0.7038$), which they correlated with less depleted (bulk earth?) mantle sources, or possibly crustal contamination. Pb isotope relationships in four of the complexes have been studied by Bell et al. B.W.

N84-20967*# Manitoba Univ., Winnipeg.
THE PIKWITONEI GRANULITE DOMAIN: A LOWER CRUSTAL

LEVEL ALONG THE CHURCHILL-SUPERIOR BOUNDARY IN CENTRAL MANITOBA Abstract Only
Werner Weber *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 95-97 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The greenschist to amphibolite facies tonalite-greenstone terrain of the Gods Lake subprovince grades - in a northwesterly direction - into the granulite facies Pikwitonei domain at the western margins of the Superior Province. The transition is the result of prograde metamorphism and takes place over 50 - 100 km without any structural or lithological breaks. Locally the orthopyroxene isograd is oblique to the structural grain and transects greenstone belts, e.g., the Cross Lake belt. The greenstone belts in the granulite facies and adjacent lower grade domain consist mainly of mafic and (minor) ultramafic metavolcanics, and clastic and chemical metasedimentary rocks. Typical for the greenstone belts crossed by the orthopyroxene isograd are anorthositic gabbros and anorthosites, and plagiophyric mafic flows. The Pikwitonei granulite domain has been interpreted as to represent a lower crustal level which was uplifted to the present level of erosion. On the basis of gravimetric data this uplift has been modelled as an obduction onto the Churchill Province during the Hudsonian orogeny, similar to the Ivrea Zone. The fault between the Churchill and Superior Province is described. B.W.

N84-20968*# Zimbabwe Univ., Salisbury.
THE GREENSTONE BELTS OF ZIMBABWE Abstract Only
James F. Wilson *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 98 (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

The present configuration of the greenstone belts is explained. Three ages of granite-greenstone terrain can be recognized within the Zimbabwe Archean Craton. The oldest greenstone belt remnants constitute the volcano-sedimentary Sebakwian group dated at c. 3.5 Ga minimum on the evidence from various granites and gneisses. The more extensive, main greenstone belts comprise the dominantly volcanic Bulawayan Group and dominantly sedimentary Shamvaian Group. An unconformity within the Bulawayan Group allows its subdivision into the Lower and Upper Greenstones. The Lower Greenstones possibly form part of a granite-greenstone terrain about 2.9 Ga old. The widespread Upper Greenstones and the locally developed, unconformably overlying Shamvaian Group are about 2.7 Ga old. Two suites of late granites post-date the main greenstone belts. These comprise that tonalitic Sesombi Suite at c. 2.7 Ga and the more potashrich Chilimanzi Suite at c. 2.6 Ga. B.W.

N84-20969*# Geological Survey of Canada, Ottawa (Ontario).
THE ARCHEAN CRUST IN THE WAWA-CHAPLEAU-TIMMINS REGION. A FIELD GUIDEBOOK PREPARED FOR THE 1983 ARCHEAN GEOCHEMISTRY-EARLY CRUSTAL GENESIS FIELD CONFERENCE
John A. Percival, Kenneth D. Card, R. P. Sage (Ontario Geological Survey), Larry S. Jensen (Ontario Geological Survey), and L. E. Luhta (Ontario Ministry of Natural Resources) *In* Lunar and Planetary Inst. Workshop on a Cross Section of Archean Crust 1983 p 98-169 refs (For primary document see N84-20947 11-46)
Avail: NTIS HC A09/MF A01 CSCL 08G

This guidebook describes the characteristics and interrelationships of Archean greenstone-granite and high-grade gneiss terrains of the Superior Province. A 300-km long west to east transect between Wawa and Timmins, Ontario will be used to illustrate regional-scale relationships. The major geological features of the Superior Province are described. B.W.

N84-20970*# California Inst. of Tech., Pasadena. Seismological Lab.
THE UPPER MANTLE BENEATH THE CASCADE RANGE: A COMPARISON WITH THE GULF OF CALIFORNIA
Marianne C. Walck 16 Mar. 1984 68 p refs
(Grant NsG-7610)
(NASA-CR-175428; NAS 1.26:175428) Avail: NTIS HC A04/MF A01 CSCL 08G

Seismograms from 22 earthquakes along the northeast Pacific rim recorded in southern California form the data set for investigation of the upper mantle beneath the Cascade Range-Juan de Fuca region, a transitional area encompassing both very young ocean floor and a continental margin. These data consist of 853 seismograms (6 deg < delta < 42 deg) which produce 1068 travel times and 40 ray parameter estimates. These data are compared directly to another large suite of records representative of structure beneath the Gulf of California, an active spreading center. The spreading center model, GCA, was used as a starting point in WKBJ synthetic seismogram modeling and perturb GCA until the northeast Pacific data are matched. Application of wave field continuation to these two groups of data provides checks on model's consistency with the data as well as an estimate of the resolvability of differences between the two areas. Differences between the models derived from these two data sets are interpretable in terms of lateral structural variation beneath the two regimes. Author

N84-20971*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LONGWAVE RADIATION PARAMETERIZATION FOR UCLA/GLAS GCM
Harshhvardhan and Thomas G. Corsetti Mar. 1984 53 p refs
(NASA-TM-86072; NAS 1.15:86072) Avail: NTIS HC A04/MF A01 CSCL 04A

This document describes the parameterization of longwave radiation in the UCLA/GLAS general circulation model. Transmittances have been computed from the work of Arking and Chou for water vapor and carbon dioxide and ozone absorptances are computed using a formula due to Rodgers. Cloudiness has been introduced into the code in a manner in which fractional cover and random or maximal overlap can be accommodated. The entire code has been written in a form that is amenable to vectorization on CYBER and CRAY computers. Sample clear sky computations for five standard profiles using the 15- and 9-level versions of the model have been included. Author

N84-20972*# Massachusetts Inst. of Tech., Cambridge. Dept. of Earth and Planetary Sciences.
TECTONIC DEFORMATION OF THE ANDES AND THE CONFIGURATION OF THE SUBDUCTED SLAB IN CENTRAL PERU: RESULTS FROM A MICRO-SEISMIC EXPERIMENT
G. Suarez, J. Gagnepain (Paris VI Univ.), A. Cisternas (Paris VI Univ.), D. Hatzfeld (Grenoble-1 Univ.), P. Molnar, L. Ocola (Instituto Geofisico del Peru, Lima), S. W. Roecker, and J. P. Viode (Paris VI Univ.) [1983] 41 p refs Sponsored in part by Institute National d'Astronomie et de Geophysique
(Grant NAG5-300)
(NASA-CR-175445; NAS 1.26:175445) Avail: NTIS HC A03/MF A01 CSCL 08K

The vast majority of the microearthquakes recorded occurred to the east: on the Huaytapallana fault in the Eastern Cordillera or in the western margin of the sub-Andes. The sub-Andes appear to be the physiographic province subjected to the most intense seismic deformation. Focal depths for the crustal events here are as deep as 50 km, and the fault plane solutions, show thrust faulting on steep planes oriented roughly north-south. The Huaytapallana fault in the Cordillera Oriental also shows relatively high seismicity along a northeast-southwest trend that agrees with the fault scarp and the east dipping nodal plane of two large earthquakes that occurred on this fault in 1969. The recorded microearthquakes of intermediate depth show a flat seismic zone about 25 km thick at a depth of about 100 km. This agrees with the suggestion that beneath Peru the slab first dips at an angle of 30 deg to a depth of 100 km and then flattens following a quasi-horizontal trajectory. Fault plane solutions of intermediate depth microearthquakes have horizontal T axes oriented east-west. A.R.H.

N84-20973# Hawaii Inst. of Geophysics, Honolulu.
SPECTRAL ANALYSES OF HIGH-FREQUENCY Pn, Sn PHASES FROM VERY SHALLOW FOCUS EARTHQUAKES Final Technical Report
Daniel A. Walker Sep. 1983 180 p
(Contract F49620-81-C-0065; AF Proj 2309)
(AD-A137778; AFOSR-84-0059TR) Avail: NTIS HC A09/MF A01 CSCL 08/11

Contents: Spectra of nuclear explosions, earthquakes, and noise from Wake Island bottom hydrophones; Spectral characteristics of high-frequency Pn. Sn phases in the Western Pacific; Oceanic Pn/Sn: a qualitative explanation and reinterpretation of the T-phase; A Preliminary Informal Comparison of Signal/Noise Capabilities Between the Wake Bottom Hydrophone Array, the Ocean Sub-Bottom Seismometer, and Ocean Bottom Seismometers; Po/So Phases: Propagation Velocity and Attenuation Across a 1600 km Long Deep Ocean Hydrophone Array; The Continuous Digital Data Collection System for the Wake Island Hydrophones; List of Events Processed by the Wake Digital Data Collection System. GRA

N84-20974# Bedford Research Associates, Mass.
INVESTIGATE AND VERIFY THE VALIDITY OF MATHEMATICAL FORMULAS IN RELATION TO DATA OBTAINED FROM THEORETICAL INVESTIGATIONS AND EXPERIMENTAL OBSERVATIONS Final Report, May 1980 - Sep. 1983
P. Meehan, F. Battles, and K. Scharr Hanscom AFB, Mass. AFGL 28 Oct. 1983 37 p
(Contract F19628-80-C-0124; AF Proj. 9993)
(AD-A137847; AFGL-TR-83-0301) Avail: NTIS HC A03/MF A01 CSCL 04/1

C sub n squared (optical) studies in the free atmosphere based on rawinsonde data are discussed. A model for estimating one-minute rainfall rates, an interactive system for J4 data base creation, and an interactive system for data retrieval are given. GRA

N84-20975# Bedford Research Associates, Mass.
APPLICATION OF METHODS OF NUMERICAL AND SOFTWARE ENGINEERING ANALYSIS TO PHYSICAL AND ENGINEERING DATA COLLECTED IN A VARIETY OF LABORATORY AND FIELD MEASUREMENT PROGRAMS Final Report, Sep. 1980 - Sep. 1983
P. Moss, H. Wadzinski, D. Dechichio, A. Jenkins, and P. Meehan 28 Oct. 1983 41 p
(Contract F19628-80-C-0216; AF Proj. 9993)
(AD-A137863; AFGL-TR-83-0300) Avail: NTIS HC A03/MF A01 CSCL 04/1

This report presents a summary of analyses and mathematical modelling done in support of some AFGL atmospheric research projects. In particular, work on the problems of linear filtering on intensity data, broadening of peaks in the photoelectron energy spectrum, and interactive OPAQUE file editing are discussed. Author (GRA)

N84-20976# Air Force Geophysics Lab., Hanscom AFB, Mass. Space Physics Div.
AIRGLOW MORPHOLOGY DURING AN IONOSPHERIC HEATING EXPERIMENT AT PLATTEVILLE, COLORADO Final Scientific Report
James G. Moore 9 Sep. 1983 18 p
(AF Proj. 4643)
(AD-A137869; AFGL-TR-83-0238; AFGL-ERP-852) Avail: NTIS HC A02/MF A01 CSCL 04/1

Enhancements of OI 6300 A and OI 5577 A airglow emissions were detected by the All-Sky Imaging Photometer aboard the Airborne Ionospheric Observatory during an ionospheric heating experiments at Platteville, Colorado on the night of 12-13 Oct. 1979. O-mode overdense heating produced large intensity enhancements of the 6300 A (approximately 270 R) and small intensity enhancements of the 5577 A (approximately 30 R) emissions while O-mode marginally underdense heating produce barely detectable enhancements of the 6300 A (approximately 30 R) emission only. During the overdense heating interval, the enhanced airglow patches reached an approximately circular shape with diameters of 150 km and 80 km for 6300 A and 5577 A respectively while underdense heating produced irregularly-shaped patches with dimensions of approximately 40 km x 80 km for 6300 A only. GRA

N84-20977# Brown Univ., Providence, R. I. Div. of Engineering.
CHEMICAL REACTIONS AND MOLECULAR AGGREGATION IN CRYOGENIC WHOLE AIR SAMPLE MATRICES Final Technical Report, 1 Oct. 1981 - 31 Mar. 1983
J. M. Calo and W. D. Lilly Hanscom AFB, Mass. AFGL Jul. 1983 119 p Original contains color illustrations
(Contract F19628-81-C-0157; AF Proj. 6687)
(AD-A137879; AFGL-TR-83-0235) Avail: NTIS HC A06/MF A01 CSCL 04/1

This report conveys the results of an investigation concerned with the effects of chemical reactions in cryogenically condensed NOx/Ox/H2O samples, on the alteration of sample composition upon subsequent thermal desorption. These studies were undertaken to elucidate the relevant mechanisms and improve the understanding of these processes as they relate to the analysis of cryogenically-collected stratospheric whole air samples acquired in the balloon-borne sampling project of the composition task of the Stratospheric Environment Program of the Air Force Geophysics Laboratory. The results of this work indicate that interconversion of the oxides of nitrogen in condensed samples, especially in the presence of water vapor, is a significant process under certain conditions. However, additional work involving careful cryogenic deposition of very small amounts of the various species, combined with perhaps high resolution FTIR, is definitely needed in order to quantitatively assess the relative importance of these same processes in the much more highly dilute stratospheric cryogenic whole air samples. GRA

N84-20978# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
THE EFFECT OF VERTICAL DATUM INCONSISTENCIES ON THE DETERMINATION OF GRAVITY RELATED QUANTITIES
Piotr Laskowski Aug. 1983 98 p
(Contract F19628-82-K-0022; AF Proj. 2309)
(AD-A137881; OSU/DGSS-349; SR-4; AFGL-TR-83-0228) Avail: NTIS HC A05/MF A01 CSCL 08/5

Three different models of inconsistencies in the world vertical datum due to the Sea Surface Topography problem are constructed. A spherical harmonic decomposition of different models of global vertical datum inconsistencies into a set of potential coefficients up to degree and order 180 is described. The effect of datum inconsistency is found significant at low degree harmonics and negligible above degree 60. The maximum relative error (by degree variances of coefficients) is estimated as 1%. In terms of the error in geoid undulation the absolute cumulative effect of datum inconsistency can be of the order of 0.5 m which is of the order to the amplitude of Sea Surface Topography variation. In terms of the error in gravity anomaly, the cumulative effect can be of the order of 0.1 mgal. The effect of the internal distortion of the North America vertical datum due to the overconstrained adjustment of the 1929 levelling net is found to produce the cumulative error in geoid undulation of the order to 2 millimeters, and in terms of gravity anomaly this error is estimated as 0.0001 mgals. The secondary effect on the zero-degree undulation term when the gravity anomaly data in the spherical cap are used through the Stokes' equation to produce the geoid undulation field is found to be of the order of 1 cm for most practical applications. GRA

N84-20979# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
A STUDY OF LOW ENERGY ELECTRON PRECIPITATIONS AND AURORAL PHENOMENA BY USING THE USAF POLAR ORBITING SATELLITES Final Scientific Report, 1 Oct. 1978 - 30 Sep. 1983
Ching-I. Meng Sep. 1983 55 p

(Grant AF-AFOSR-0010-79; AF Proj. 2311)
(AD-A137888; AFOSR-84-0060TR) Avail: NTIS HC A04/MF A01 CSCL 04/1

The main objective of this research project is to study the low energy electron precipitation and auroral phenomena over polar regions. The research is based on using various types of measurements from several USAF satellites at both low altitude polar orbits and high altitude geosynchronous orbits. These are focused on: (1) to investigate the different kinds of polar electron precipitations such as various auroral displays, the polar cusp region, conjugate photoelectrons, polar rain over the polar cap; (2) to determine precipitation characteristics for various kinds of magnetospheric and geophysical phenomena; (3) to investigate the physics and configuration of the polar cusp region and the polar cap region; and (4) to understand the morphology of magnetospheric particle population. The results of these studies can lead us to a better understanding of the interaction between the solar-wind and the geomagnetic field and also the coupling between the magnetosphere and the ionosphere. GRA

N84-20980# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.

A COMPUTER CODE TO CALCULATE EMISSION AND TRANSMISSION OF INFRARED RADIATION THROUGH NON-EQUILIBRIUM ATMOSPHERES Interim Scientific Report

R. D. Sharma, R. D. Siani, M. K. Bullitt (Arcon Corp.), and P. P. Wintersteiner 8 Jul. 1983 52 p Sponsored in part by the Southeast Center for Electrical Engineering Education
(AF Proj. 2310)
(AD-A137162; AFGL-TR-83-0168; AFGL-ERP-842) Avail: NTIS HC A04/MF A01 CSCL 09/2

A computer code that calculates infrared radiance in the upper atmosphere has been developed. The code, for limb-looking geometry and conditions where local thermodynamic equilibrium may not hold, utilizes individual ro-vibrational transitions to calculate the optical thicknesses along each segment of the line-of-sight path. The formulation of the problem is given, as is the means of using the program and the procedure for obtaining input data from certain data bases. Appendices contain program listings and two examples. Author (GRA)

N84-20981# Birmingham Univ. (England). Dept. of Space Research.

IONIC REACTIONS OF ATMOSPHERIC IMPORTANCE Interim Scientific Report, 1 Feb. 1982 - 30 Sep. 1983

David Smith and Nigel G. Adams 30 Nov. 1983 49 p Sponsored in part by the European Office of Aerospace Research and Development
(Grant AF-AFOSR-0095-82; AF Proj. 2303; AF Proj. 2301)
(AD-A137166; AFGL-TR-83-0327; ISR-1) Avail: NTIS HC A03/MF A01 CSCL 04/1

A variable-temperature flowing afterglow/Langmuir probe (FALP) apparatus has been used to study the temperature dependence of a number of electron-ion dissociative recombination coefficients, alpha e, and electron attachment coefficients, Beta, over the temperature range 200-600 K. Thus alpha e(02(+)), alpha e(NO+)) and alpha e(NH4+)) have been shown to vary inversely with temperature, T, as alpha e approximately T to the -n power with n = 0.7, 0.9 and 0.6 respectively. Alpha e(H30+)) was found to be independent of temperature. Beta(CC14), Beta(CC13F) and Beta (SF6) were all very large, close to their theoretical maximum values (approximately .0000004 cc/s at 300 K) and varied only very slowly with temperature over the available range, whereas Beta(CC12F2), Beta(CHC13) and Beta(C12) were smaller and increased appreciably with temperature. From the data, activation energies, Ea, were obtained for the dissociative attachment reactions of CC13F, CC12F2, CHC13 and C12. Thus Ea(CC13F) approximately 0.02eV, Ea(CC12F2) approximately 0.15eV, Ea(CHC13) approximately 0.12 eV and Ea(C12) approximately 0.05 eV. GRA

N84-20982# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A METHOD TO ESTIMATE THE VERTICAL DISPERSION PARAMETER IN A 10 Km RANGE

Lei Xiaoen, Jia Xinyuan, and Yang Jinte 23 Dec. 1983 17 p Transl. into ENGLISH from Daqi Kexue (China), v. 5, no. 4, Dec. 1981 p 368-375
(AD-A137192; FTD-ID(RS)T-1647-83) Avail: NTIS HC A02/MF A01 CSCL 04/1

Based on the Monin-Batchelor Similarity Theory and the concept of effective roughness length, this paper presented an empirical vertical dispersion model in a 10 kilometer range. It could be used under a flat and homogeneous, as well as complex, topographical condition. Author

N84-20983# Physical Dynamics, Inc., Bellvue, Wash.

HILAT: A PRE-LAUNCH OVERVIEW

Edward J. Fremouw 13 Jun. 1983 42 p
(Contract DNA001-81-C-0189; DNA Proj. I25-AAXH)
(AD-A137266; AD-E301301; PD-NW-83-296R; DNA-TR-81-276) Avail: NTIS HC A03/MF A01 CSCL 04/1

Among the many nuclear-weapons effects that must be accounted for in the design of c3I systems is that of radiowave scintillation produced by scattering in high-altitude structured plasmas. Accordingly, the Defense Nuclear Agency (DNA) conducts a vigorous research program on the nature of such structure and the mechanisms for its production. Past results have indicated significant similarity between that nature and those mechanisms in nuclear-disturbed cases and in the case of the ambient ionosphere disturbed by geophysical process, the variety of which is greatest at high latitudes. To further DoD's knowledge of the three-dimensional spectrum of the scattering structures and its understanding of their production, evolution, and decay, DNA and the Air Force Geophysics Laboratory, along with their respective contractors, have joined together to prepare a multi-experiment satellite mission, called HiLat, to collect definitive data on those processes. In view of applications to any military or civilian system that must transmit radio signals through the disturbed high-latitude ionosphere, including for instance satellite-based search-and-rescue systems, cooperation also is being received from the National Research Council of Canada. The satellite designed to meet these diverse but highly complementary objectives, P83-1, is scheduled for launch from Vandenberg Air Force Base at 1530 Z on 27 June 1983. GRA

N84-20984# Los Alamos Scientific Lab., N. Mex.

PARTICLE AND FIELD SIGNATURES OF SUBSTORMS IN THE NEAR MAGNETOTAIL

D. N. Baker 1983 44 p refs Presented at the Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3-7 Oct. 1983
(Contract W-7405-eng-36)
(DE84-003777; LA-UR-83-3239; CONF-8310229-7) Avail: NTIS HC A03/MF A01

The near earth magnetotail portion of the terrestrial magnetosphere is likely the region in which magnetospheric substorms are initiated. The occurrence of substorm related magnetic reconnection in this location is discussed. The near magnetotail can be nearly continuously monitored by spacecraft that are relatively fixed in location. Observations of magnetic fields and plasma distribution functions in the neartail reveal a very regular and predictable sequence of variation in association with substorms. The data provide very strong evidence for the neutral line substorm model and for the regular occurrence of magnetic reconnection in the near earth magnetotail during substorms. DOE

N84-20985# Oak Ridge Associated Universities, Tenn. Inst. for Energy Analysis.

RELATIONSHIP BETWEEN GLOBAL FOSSIL-FUEL CONSUMPTION AND THE CONCENTRATION OF CARBON DIOXIDE IN THE ATMOSPHERE, PART 2 Final Report, Oct. 1979 - Mar. 1982

Gregg Marland Chicago Gas Research Inst. Jun. 1983 133 p refs Sponsored by Gas Research Inst.
(PB84-138841; GRI-81/0197-2) Avail: NTIS HC A07/MF A01 CSCL 04A

This study has involved a complete review of the historic rate of CO2 discharge to the atmosphere from fossil fuel burning. Considering the rates of fuel production, variability of fuel composition, and variety of fuel uses, we have calculated a time series for CO2 emissions since 1950. The results are consistent with and hence substantiate earlier findings that were based on less clear fuel statistics. A mathematical model of the global carbon cycle has been developed and documented. GRA

N84-20893# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF FREELY ASCENDING CONVECTIVE JETS INITIATED BY ACTIVE ADMIXTURE
L. Kh. Ingel *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 4 Transl. into ENGLISH from Izv. Akad Nauk SSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 987-988 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20894# Joint Publications Research Service, Arlington, Va.
MEASUREMENTS OF COEFFICIENT OF TURBULENT DIFFUSION IN MIDDLE-LATITUDE STRATO- AND MESOSPHERE
V. F. Barbuzenko, V. T. Surkov, and A. A. Khananyan *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 5 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 10, Oct. 1983 p 1089-1091 (For primary document see N84-20891 11-46)
Copyright. Avail: NTIS HC A04

N84-20897# Joint Publications Research Service, Arlington, Va.
SOVIET INVESTIGATIONS OF EARTH'S GRAVITY FIELD
M. Ye. Kheyfets *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 42-49 Transl. into ENGLISH from Zemlya i Vselennaya (USSR), no. 6, Nov. - Dec. 1983 p 23-27 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20898# Joint Publications Research Service, Arlington, Va.
DETERMINING DENSITY OF UPPER MANTLE ROCKS
N. A. Shilo and Yu. Ya. Vashchilov *In* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 50-51 Transl. into ENGLISH from Dokl. Akad. SSSR (USSR), v. 273, no. 3, Nov. 1983 p 695-698 (For primary document see N84-20891 11-42)
Avail: NTIS HC A04

N84-20899# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF STRATOSPHERIC AEROSOLS FORMING DURING COMBUSTION OF ROCKET FUELS ON EARTH'S ALBEDO
F. B. Yurevich, G. M. Yatskevich, and R. D. Cess *In* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 52 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 988-990 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20900# Joint Publications Research Service, Arlington, Va.
DETERMINING OPTICAL CHARACTERISTICS OF STRATOSPHERIC AEROSOL BY MULTIFREQUENCY LASER SOUNDING METHOD
E. V. Makiyenko and I. E. Naats *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 53 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 991-994 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20901# Joint Publications Research Service, Arlington, Va.
ALTITUDINAL CHANGE IN CONTINUOUS ABSORPTION IN ATMOSPHERIC TRANSPARENCY WINDOW 8-12 MICRONS
G. V. Telegin and V. V. Fomin *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 53-54 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 995-998 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20902# Joint Publications Research Service, Arlington, Va.
VERTICAL TEMPERATURE GRADIENT IN TROPOSPHERE AND ITS RELATIONSHIP TO SURFACE TEMPERATURE ACCORDING TO EMPIRICAL DATA
I. I. Mokhov *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 54-55 Transl. into ENGLISH from Izv. Akad. Nauk SSSR: Fiz. Atmosfery i Okeana (USSR), v. 19, no. 9, Sep. 1983 p 913-919 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-21452*# Hawaii Univ., Honolulu. Inst. of Geophysics.
SEAMARC 2 SIDE-SCAN IMAGES OF SUBMARINE VOLCANOES: POTENTIAL ANALOGUES FOR VENUS
P. Fryer, D. Hussong, and P. J. Mouginis-Mark *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 10-15 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 08K

N84-21460*# Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
WAS THE EARLY EARTH COMPLETELY MOLTEN?
Donald L. Turcotte and Joan C. Pflugrath *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 45-46 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 08G

N84-21464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOWARD A COMPLETE INVENTORY OF STRATOSPHERIC DUST PARTICLES WITH IMPLICATIONS AND THEIR CLASSIFICATION
Michael E. Zolensky, Ian D. R. Mackinnon, and David S. McKay *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 P 58-59 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 04A

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N84-20986 Florida State Univ., Gainesville.
ON THE ONSET OF THE PLANETARY SCALE MONSOON Ph.D. Thesis
Richard Joseph Pasch 1983 250 p
Avail: Univ. Microfilms Order No. DA8329423

A hypothesis concerning the spatial scale of the onset of the Asian southwest monsoon of the Northern Hemispheric summer is put forth. It is implied, from the large climatology of the tropospheric motion and temperature fields in May and June, that the monsoon onset is characterized by radical changes in the tropical circulations on a planetary scale. A suitable framework for the quantitative definition of this phenomenon, i.e., the atmospheric energetics in the zonal wavenumber domain, is reviewed. Global tropospheric wind and temperature data for periods surrounding the Indian monsoon onset cases of 1973, 1977 and 1979 are utilized. It is found that the kinetic and available potential energy of the sum of zonal wavenumbers 1, 2 and 3 (defined as the planetary scale waves) increase by about 30 to 50% on the time scale of about 1 week, corresponding to Indian (regional) onset. This increase characterizes the planetary scale onset.
Dissert. Abstr.

N84-20987 Wisconsin Univ., Madison.
ON THE ROLE OF THE BAROCLINIC STRUCTURE IN EXTRATROPICAL CYCLONE DEVELOPMENT: A CASE STUDY Ph.D. Thesis
Jack James Katzfey 1983 310 p
Avail: Univ. Microfilms Order No. DA8323383

The importance of the baroclinic structure in cyclone development is studied through quasi-Lagrangian diagnostics for three

time periods of an Alberta cyclone which transited the upper Midwest between 31 March and 2 April 1971. Storm relative isentropic frontogenesis equations are developed and analyzed to diagnose the changes in the frontal zones. Changes in the baroclinic structure are related to cyclone development through analysis of the spatial distribution of the storm relative components of ageostrophic mass transport and the development of the inward eddy angular momentum transport. Storm relative frontogenesis of the cold front initially occurred through an indirect circulation during dry baroclinic development for low layers and during the transition period for the mid layers. A direct circulation developed during the transition period for other portions of the cold front and for the warm front. Divergent inertial flow aloft resulting from the S shaped baroclinic structure for this cyclone was associated with this direct circulation. Dissert. Abstr.

N84-20988*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

KINEMATIC ANALYSIS OF HURRICANE FREDERICK (1979) USING SATELLITE, AIRCRAFT AND RAWINSONDE DATA Final Report

William M. Frank Mar. 1984 90 p refs

(Grant NAG5-102)

(NASA-CR-175430; NAS 1.26:175430) Avail: NTIS HC A05/MF A01 CSCL 04B

Results of kinematic analyses of Hurricane Frederick (1979) performed using satellite wind vectors, aircraft measurements and rawinsonde data are presented. The data were gathered, reduced, preliminarily integrated and used to analyze the structure of the storm in the inflow and outflow layers. The mean structure at large radii is in good agreement with composite analyses of tropical cyclones. Changes in the storm structure from 11 to 12 Sep. 1979 suggest that remote sensing techniques are useful in monitoring storm intensity. A more sophisticated integration of the various data, including determination of optimum heights for satellite wind vectors, is underway. Author

N84-20989# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

UIJONGBU, CAMP LAGUARDIA, KOREA, LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS) Final Report

14 Oct. 1983 100 p

(AD-A137573; AD-E850486; USAFETAC/DS-83/042) Avail: NTIS HC A05/MF A01 CSCL 04/2

This report is similar to a Revised Uniform Summary of Surface Weather Observations (RUSSWO) except the summary generated is from data observed at limited-duty observation sites. This summary is blocked based on the normal hours of observation and only those tables using hourly data are presented. Caution must be exercised when using these summaries as the data reflect conditions occurring only during limited duty hours of operation. This report is a five-part statistical summary of surface weather observations for Uijongbu, Camp LaGuardia, Korea. It contains the following parts: (1) Weather conditions; (2) Surface winds; (3) Ceiling versus visibility; (4) Psychrometric summaries (psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (5) Pressure summary (means, standard deviations and observation counts of station and/or sea-level pressure). Summaries in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables. GRA

N84-20990# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

FORT WAINWRIGHT, WAINWRIGHT AAF, ALASKA, LIMITED SURFACE OBSERVATIONS CLIMATIC SUMMARY (LISOCS) Final Report

13 Oct. 1983 400 p

(AD-A137574; AD-E850487; USAFETAC/DS-83/044) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is similar to a Revised Uniform Summary of Surface Weather Observations (RUSSWO) except the summary generated is from data observed at limited-duty observation sites. This summary is blocked based on the normal hours of observation and only those tables using hourly data are presented. Caution must be exercised when using these summaries as the data reflect conditions occurring only during limited duty hours of operation. This report is a five-part statistical summary of surface weather observations for Fort Wainwright, Wainwright AAF, Alaska. It contains the following parts: (1) Weather conditions; (2) Surface winds; (3) Ceiling versus visibility; (4) Psychrometric summaries (psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (5) Pressure summary (means, standard deviations and observation counts of station and/or sea-level pressure). Summaries in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables. GRA

N84-20991# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: DYESS AFB, TEXAS Final Report

21 Sep. 1983 425 p Supersedes USAFETAC/DS-79/107, AD-A079 84

(AD-A137575; AD-E850488; USAFETAC/DS-83/045-Rev; USAFETAC/DS-79/107) Avail: NTIS HC A18/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Dyess AFB, Texas. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20992# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: TONOPAH, NEVADA Final Report

21 Sep. 1983 450 p Supersedes USAFETAC/DS-81/092

(AD-A137576; AD-E850489; USAFETAC/DS-83/046-REV; USAFETAC/DS-81/092) Avail: NTIS HC A19/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Tonopah, Nevada. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20993# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

REVISED UNIFORM SUMMARY OF SURFACE WEATHER OB-

SERVATIONS (RUSSWO). PART A-F: PHILLIPS, ABERDEEN, MARYLAND Final Report
3 Nov. 1983 320 p
(AD-A137577; AD-E850500; USAFETAC/DS-83/047-Rev) Avail: NTIS HC A14/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Phillips, Aberdeen, Maryland. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20994# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: GELA, ITALY Final Report
3 Nov. 1983 320 p
(AD-A137578; AD-E850501; USAFETAC/DS-83/048-Rev) Avail: NTIS HC A14/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Gela, Italy. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20995# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: DHAHRAN, SAUDI ARABIA Final Report
1 Dec. 1983 400 p
(AD-A137580; AD-E850503; USAFETAC/DS-83/050-Rev) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Dhahran, Saudi Arabia. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; Sky Cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20996# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: TRAVIS AIR FORCE BASE, CALIFORNIA Final Report
22 Mar. 1984 400 p Supersedes USAFETAC/DS-80/007
(AD-A137581; USAFETAC/DS-83/052-Rev; USAFETAC/DS-80/007) Avail: NTIS HC A17/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Travis Air Force Base, California. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values): (3) Surface winds; (4) Ceiling versus vivibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures; psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20997# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
LIMITED SURFACE OBSERVATIONS CLIMATIC SURVEY (LISOCS), BAUMHOLDER, WEST GERMANY Final Report
9 Jan. 1984 150 p
(AD-A137582; AD-E850506; USAFETAC/DS-84/001) Avail: NTIS HC A07/MF A01 CSCL 04/2

This report is similar to a Revised Uniform Summary of Surface Weather Observations (RUSSWO) except the summary generated is from data observed at limited-duty observation sites. This summary is blocked based on the normal hours of observation and only those tables using hourly data are presented. Caution must be exercised when using these summaries as the data reflect conditions occurring only during limited duty hours of operation. This report is a five-part statistical summary of surface weather observations for Baumholder, Germany (West). It contains the following parts: (1) Weather conditions; (2) Surface winds; (3) Ceiling versus visibility; (4) Psychrometric summaries (psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet-bulb and dew point temperatures and relative humidity); and (5) Pressure summary (means, standard deviations and observation counts of station and/or sea-level pressure). Summaries in this report are presented in tabular form, in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurrence tables. GRA

N84-20998# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
REVISED UNIFORM SUMMARY OF SURFACE WEATHER OBSERVATIONS (RUSSWO). PARTS A-F: ANDERSEN AFB, GUAM Final Report
16 Jan. 1984 320 p Supersedes USAFETAC/DS-79/117, AD-A079 84
(AD-A137583; AD-E850507; USAFETAC/DS-84/002-Rev; USAFETAC/DS-79/117) Avail: NTIS HC A14/MF A01 CSCL 04/2

This report is a six part statistical summary of surface weather observations for Andersen AFB, Guam. It contains the following parts: (1) Weather conditions; Atmospheric phenomena; (2) Precipitation, Snowfall and Snow Depth (daily amounts and extreme values); (3) Surface winds; (4) Ceiling versus visibility; sky cover; (5) Psychrometric Summaries (daily maximum and minimum temperatures, extreme maximum and minimum temperatures, psychrometric summary of wet-bulb temperature depression versus dry-bulb temperature, means and standard deviations of dry-bulb, wet bulb and dew point temperatures and relative humidity); and (6) Pressure Summary (means, standard, deviations, and observation counts of station pressure and sea-level pressure). Data in this report are presented in tabular form in most cases in percentage frequency of occurrence or cumulative percentage frequency of occurring tables. GRA

N84-20999# Naval Oceanography Command Detachment, Asheville, N.C.
CLIMATIC STUDY OF THE SOUTHERN CALIFORNIA OPERATING AREA NEAR COASTAL ZONE
Oct. 1983 207 p
(AD-A137698) Avail: NTIS HC A10/MF A01 CSCL 04/2

This climate study consists of monthly charts and tables of (1) clouds, (2) visibility-tables, (3) ceiling-visibility (mid range), (4) wind-visibility-cloudiness, (5) scalar mean wind speed, (6) wind speed < 11 and > or = 34 knots, (7) wind speed 11-21 and 22-33 knots, (8) air and sea temperature, (9) surface wind roses, (10) wave height-isopleths, (11) wave height-tables, (12) surface currents (seasonal), and station climatic summaries. GRA

N84-21000# Naval Oceanography Command Center/Joint Typhoon Warning Center, FPO San Francisco, Calif.
TROPICAL CYCLONE REPORT, JANUARY - DECEMBER 1983 Annual Report, Jan. - Dec. 1983
B. L. Holt, S. A. Sandgathe, M. E. Older, III, B. R. Columbus, and R. L. Allen, Jr. 1983 212 p
(AD-A137836) Avail: NTIS HC A10/MF A01 CSCL 04/2

This annual publication summarizes the tropical cyclone season in the western North Pacific, Bay of Bengal and Arabian Sea. A brief narrative is given on each significant tropical cyclone, including its best track. All reconnaissance data used to construct the best tracks are provided. Forecast verification data and statistics for the JTWC are summarized. Research efforts at the JTWC and recent NOCC. JTWC publications are briefly discussed. GRA

N84-21001# Science Applications, Inc., Monterey, Calif.
FORECAST AIDS FOR PREDICTING TROPICAL CYCLONE ASSOCIATED GUSTS AND SUSTAINED WINDS FOR AGANA, HONG KONG, KADENA AND MISAWA Final Report
J. D. Jarrell and J. F. Sanders Dec. 1983 50 p
(Contract N00228-83-C-3079)
(AD-A137846; NEPRF-CR-83-08) Avail: NTIS HC A03/MF A01 CSCL 04/2

Forecast aids for predicting wind conditions when tropical cyclones pass within 360 n mi of a station are provided for Agana, Hong Kong, Kadena and Misawa. A circle with a 360 n mi radius, which was centered on each station, was divided into 71 equal area segments. Data sets consisting of the ratios of station wind values to tropical cyclone center wind values were developed. Computed ratio wind values were then assigned to the grid areas designated by the position of the tropical cyclone center. Values of mean and maximum gust ratios for two intensity classifications of the tropical cyclones were analyzed to produce the forecast aids for the stations. GRA

N84-21002# Air Force Geophysics Lab., Hanscom AFB, Mass.
ON THE HORIZONTAL AND VERTICAL VARIABILITY OF THE VERTICAL TURBULENT EDDY DIFFUSION COEFFICIENTS IN THE MESOSPHERE Environmental Research Papers
S. P. Zimmerman and T. J. Keneshea 22 Aug. 1983 17 p
(AF Proj. 6690)
(AD-A137877; AFGL-TR-83-0227; AFGL-ERP-851) Avail: NTIS HC A02/MF A01 CSCL 04/2

Utilizing the premise of turbulent energy balance and an altitude-invariant non-dimensional relations of turbulent heat flux, vertical turbulent diffusivities are obtained from bodies of data consisting of winds and temperature in the upper atmosphere. These are specific to the small scale turbulent motions of the atmosphere and should be differentiated from those determined from the study of wave interactive damping mechanisms. The average values of the turbulent diffusivities derived in this work are presented as a function of latitude, and are compared to those derived by an alternative method. GRA

N84-21003# Air Force Geophysics Lab., Hanscom AFB, Mass. Meteorology Div.
MELTING LAYER SURVEY Final Report
Ian D. Cohen and Hugh J. Sweeney 12 Aug. 1983 34 p
(AF Proj. 6670; AF Proj. 2310)
(AD-A137911; AFGL-TR-83-0200; AFGL-ERP-848) Avail: NTIS HC A03/MF A01 CSCL 04/2

Research involving the region of clouds in which snowflakes and ice crystals melt is reviewed. Studies of how ice crystals and snowflakes melt are examined and show that in general, melting is slower and less structured than was previously realized. An investigation of the radar bright band is included. The increase of returned signal from the melting particles in the bright band comes from the increase of the index of refraction when the particles turn from snow to water. This is not a radar/particle-surface phenomenon, but it is a radar/particle-density interaction. Thus the bright band does not begin at the top of the melting layer as the particles first begin to melt but appears at a lower level when a sufficient mass has melted. The literature survey presented in AFGL-TR-82-0007 is revised and expanded. GRA

N84-21004# Air Force Geophysics Lab., Hanscom AFB, Mass. Atmospheric Prediction Branch.
THE USE OF INTERACTIVE GRAPHICS PROCESSING IN SHORT-RANGE TERMINAL WEATHER FORECASTING: AN INITIAL ASSESSMENT Interim Scientific Report
Donald A. Chisholm, Arthur J. Jackson, Michael E. Niedzielski (Systems and Applied Sciences Corp.), Randy Schechter (Systems and Applied Sciences Corp.), and Charles F. Ivaldi (Systems and Applied Sciences Corp.) 31 Mar. 1983 179 p
(AF Proj. 6670)
(AD-A137165; AFGL-TR-83-0093; AFGL-ERP-833) Avail: NTIS HC A09/MF A01 CSCL 04/2

The products judged most useful in preparing short-range terminal forecasts included (1) a station model time series display, (2) conventional geographic data displays presented simultaneously as four quadrant panels guidance on one screen, (3) mesoscale surface objective analyses, and (4) a forecast guidance prodecure based on 2-D upper-air trajectories and sensible weather algorithms based on imagery from the GOES satellite. The importance of half-hourly visible and IR imagery from the GOES satellite in short-range terminal forecasting was confirmed in this experiment. The participating forecasters relied more heavily on it to prepare their forecasts than any other source. The manipulation of digital imagery in a computer-based interactive graphic system through time-series looping, color enhancements, and overlaying conventional plots and analyses on it, provides a wealth of qualitative and quantitative guidance for forecasting. The numerical forecasts yielded superior rms errors compared to persistence at all forecast intervals except 1 h. At 4 h, the improvement over persistence ranged from about 21 percent for wind forecasts to about 34 percent for total cloud amount, while the 6-h quantitative precipitation forecasts yielded a 39 percent improvement. GRA

N84-21005# Air Force Geophysics Lab., Hanscom AFB, Mass. Ground Based Remote Sensing Branch.
JOINT AGENCY TURBULENCE EXPERIMENT: ENVIRONMENTAL RESEARCH PAPER Interim Scientific Report
Alan R. Bohne 13 Jul. 1983 67 p
(AF Proj. 6670)
(AD-A137167; AFGL-TR-83-0180; AFGL-ERP-844) Avail: NTIS HC A04/MF A01 CSCL 04/2

Doppler radar data acquired during the 1981 Joint Agency Turbulence Experiment are presented. Pulse-pair processed reflectivity factor and Doppler spectrum mean data collected during volume scan periods are displayed over constant height surfaces at aircraft penetration level. Time histories of tracking-gate Doppler spectrum mean and variance data collected during aircraft storm penetration periods are also presented. These data show the Doppler spectrum variance to be poorly correlated with gradients of the radial wind, suggesting turbulence is the dominant contributor to Doppler spectrum variance. The data show that areas of moderate to heavy turbulence are distributed throughout the storms. Estimations of turbulence severity are obtained through structure function and Doppler spectrum variance methods. Qualitative results suggest that for observations taken at moderate to long range, storm structure wind shear can strongly bias structure

function estimates of turbulence severity, but generally have little influence on estimates from variance methods. The effective turbulence outer scale, the maximum eddy size when the turbulence field is represented by the Kolmogorov inertial subrange law, is typically less than 2 km. GRA

N84-21006# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

A NUMERICAL ANALYSIS OF THE EFFECT OF INHOMOGENEITY AND WIND SPEED SHEAR ON THE VERTICAL DISPERSION IN THE MESOSCALE RANGE

Lei Xiaoen and Yan Bangliang 23 Dec. 1983 13 p Transl. into ENGLISH from Huanjing Kexue Xuebao (China), v. 2, no. 1, Mar. 1982 p 74-79

(AD-A137188; FTD-ID(RS)T-1649-83) Avail: NTIS HC A02/MF A01 CSCL 04/2

The effect of inhomogeneity and wind speed shear on the vertical dispersion in the mesoscale range (10-100km) was analyzed numerically. Some beneficial results were obtained. R.J.F.

N84-21007# Brookhaven National Lab., Upton, N. Y.

CHARACTERISTICS OF WIND DIRECTION MEANDER DURING ONSHORE FLOW AT A COASTAL SITE

Gilbert S. Raynor and Janet V. Hayes 1984 6 p refs Presented at the 3d Conf. on Meteorology of the Coastal Zone, Miami Beach, Fla., 9 Jan. 1984

(Contract DE-AC02-76CH-00016)

(DE84-004178; BNL-34029; CONF-840137-1) Avail: NTIS HC A02/MF A01

The occurrence and characteristics of wind direction meander at a coastal site during onshore flows was studied. The importance of meander in diffusion calculations is evaluated. DOE

N84-21008# Department of Energy, Washington, D. C. Office of Basic Energy Sciences.

CO/SUB 2 CLIMATE RESEARCH PLAN

Micheal R. Riches Dec. 1983 25 p refs

(DE84-005461; DOE/ER-0186) Avail: NTIS HC A02/MF A01

The plan addresses the questions related to the global and regional rate of CO2-induced climate change. The objective is to define the key questions in such a way that research is directed at experiments where answers are needed rather than at experiments where answers can be easily obtained. This research plan includes a short history of the effects of CO2 on climate as studied, followed by a description of the structure of the CO2-climate subsystem. The major part of the plan describes the research tasks within the subsystem. The final section of the plan addresses program priorities and scheduling. DOE

N84-21009# Argonne National Lab., Ill. Office of Atmospheric Physics Program.

REMOTE SENSING OF WINDS AND TURBULENCE ABOVE COMPLEX TERRAIN DURING ASCOT-1980

R. L. Coulter and T. J. Martin Dec. 1983 172 p refs

(Contract W-31-109-eng-38)

(DE84-004231; ANL/ER-83-1; ASCOT-83-4) Avail: NTIS HC A08/MF A01

Wind and thermal structure in the planetary boundary layer (PBL) above the Anderson Creek Valley in California were measured with a Doppler sonar system and three laser anemometers during a large, multiorganizational ASCOT experiment conducted in 1980. The bistatic Doppler system was used to measure profiles of mean and turbulent components of vertical and horizontal winds at heights up to 500 m above the surface within the pooling region of several merging valleys. The laser anemometers were deployed to measure mean flow and thermal turbulence above individual creek valleys. The local characteristics and diurnal variation of flow as influenced by nighttime drainage flows, upslope currents during the daytime, synoptic flow, and sea breezes are outlined. DOE

N84-21010# Lamont-Doherty Geological Observatory, Palisades, N. Y.

VARIATION OF ARCTIC CLOUD COVER IN SUMMER: RESULTS THROUGH FEBRUARY 1983

George J. Kukla Dec. 1983 75 p refs

(Contract DE-AC02-81EV-10665)

(DE84-005098; DOE/EV-10665/4) Avail: NTIS HC A04/MF A01

The variation of arctic cloud cover in time and space during the summer of 1979 was charted from satellite imagery in 3 to 7 day intervals. Twenty-nine charts of the cloud cover in the Arctic Basin were produced, covering the period from May 17 through August 15. Three classes of cloud thickness were separately mapped. Optically thick clouds were found to be considerably less frequent than the estimates based on earlier analyses of ground and drifting station reports. The proportion of the thickest cloud category increased markedly in mid June in connection with a traveling low pressure system which originated during early June in Central Asia, crossed the Pole on June 13th and dissipated over Baffin Island late in the month. Concurrently, the snow in the Central Arctic started melting with a subsequent drop in surface albedo and bottom melt of the ice floes. Our data show that at least in 1979 the advection of a warm moist continental air mass from Central Asia was instrumental in the establishment of the summer regime in the Central Arctic. DOE

N84-21011# Pacific Northwest Lab., Richland, Wash.

WEATHER PATTERN CLIMATOLOGY OF THE US

W. R. Barchet, W. E. Davis, P. F. Lester (San Jose State Univ., Calif.), and M. Burton (San Jose State Univ., Calif.) Jan. 1984 164 p

(Contract DE-AC06-76RL-01830)

(DE84-005883; PNL-4889) Avail: NTIS HC A08/MF A01

Weather pattern types were defined relative to the classical polar front model of a midlatitude cyclonic storm system and its associated air masses. Guidelines for classifying weather patterns on an operational basis were developed. Statistics on the frequency of occurrence, persistence and alternation of weather patterns were calculated for each grid point. Summary statistics for the entire grid and for six regions are presented. It was found that frequency of occurrence and persistence depend on the size and speed of movement of the weather pattern. Large, slow moving air masses had higher frequency of occurrence and longer persistence than small or rapidly moving features. Some types showed distinct regional preferences. An indeterminate weather pattern type accounted for those weather patterns that did not fit the polar front model or were too disorganized to be classified. The intermountain thermal low of the desert southwest dominated both frequency of occurrence and persistence in this region. Alternation from one weather pattern to another followed the polar front model of a moving cyclonic storm. The tendency for anticyclonic weather patterns to become disorganized as they weaken is noted in these patterns that change to an indeterminate pattern as they age. DOE

N84-21012# North American Weather Consultants, Inc., Salt Lake City, Utah.

CONTINUING DESIGN, REVIEW AND ANALYSIS WORK FOR THE SIERRA COOPERATIVE PILOT PROJECT Interim Report

R. D. Elliott, D. A. Griffith, J. A. Flueck (Flueck Associates), and J. F. Hannaford (Sierra Hydrotech) Sep. 1983 148 p refs

(Contract DI-07-83-V0008)

(PB84-143627; NAWC/SLWM-83-2; IR-6) Avail: NTIS HC A07/MF A01 CSCL 04B

The continuing design, review, and analysis work on the Sierra Cooperative Pilot Project (SCPP) being sponsored by the Bureau of Reclamation in the Northern Sierra Nevada of California are presented. The review and revision of an earlier SCPP-1 design developed as an exploratory research program on post-frontal convection were conducted. The preliminary design of another exploratory research program on the SCPP concerned with those stratiform cloud forms was examined. GRA

N84-20892# Joint Publications Research Service, Arlington, Va.
MEASURES TO IMPROVE ANTI-HAIL SERVICE
Yu. Sedunov *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 1-3 Transl. into ENGLISH from Pravda (USSR), 5 Oct. 1983 p 3 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N84-21013 Wisconsin Univ., Madison.
A NUMERICAL MODEL OF INTERACTIONS BETWEEN A POLAR ICE STREAM, THE OCEAN AND THE SOLID EARTH: APPLICATION TO ICE STREAM E, WEST ANTARCTICA Ph.D. Thesis
Craig Stanley Lingle 1983 181 p
Avail: Univ. Microfilms Order No. DA8323387

A time dependent numerical model has been developed to study the dynamics of a polar ice stream grounded below sea level, and applied to a West Antarctic ice stream. The purpose of the experiment is to assess the effects of rising eustatic sea level, isostatic adjustment of the solid Earth, and the formation of the Ross Ice Shelf on Holocene retreat of the ice stream to its present configuration in the Ross Embayment. The model was applied to ice stream E, which drains the Marie Byrd Land slope of the West Antarctic ice sheet, and flows between Roosevelt Island and Shirase Coast to the calving front of the Ross Ice Shelf. The retarding force, or back stress, from the Ross Ice Shelf needed to hold the model grounding line in dynamic equilibrium was found to compare closely with retarding force mapped from field data by previous investigators. This implies that the grounding line of ice stream E is in fact close to dynamic equilibrium, neither advancing nor retreating rapidly, if the ice stream and its catchment area are approximately in mass balance. Dissert. Abstr.

N84-21014# Hawaii Inst. of Geophysics, Honolulu.
THE ROLE OF EDDIES IN THE GENERAL OCEAN CIRCULATION: PROCEEDINGS OF AHA HULIKO'S HAWAIIAN WINTER WORKSHOP
Lorenz Magaard, ed., Peter Muller, ed., and Rita Pujalet, ed. 1983 363 p refs Workshop held in Manoa, Hawaii, 5-7 jan. 1983
(Grant N00014-83-G-017)
(AD-A137212) Avail: NTIS HC A16/MF A01 CSCL 08/3

A technology assessment and plans for future directions in the area of research were discussed. Areas of discussion also included: wind driven circulation, ocean circulation models, the impact of the Gulf Stream, eddy mean flow interpretation, and oceanic mesoscale variability. For individual titles, see N84-21015 through N84-21031.

N84-21015# Woods Hole Oceanographic Institution, Mass.
WAVES AND CIRCULATION DRIVEN BY OSCILLATORY WINDS IN AN IDEALIZED OCEAN BASIN
Dale Haidvogel and Peter Rhines *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 1-16 refs (For primary document see N84-21014 11-48)
(Grants NSF OCE-78-25700; NSF OCE-81-9486M; NSF OCE-80-23763)
(AD-P002650) Avail: NTIS HC A16/MF A01 CSCL 08/3

We have examined, via direct numerical integration, the transient and rectified response of a flat-bottomed barotropic ocean to a spatially localized oscillatory wind-stress pattern. These experiments exemplify in many respects the dynamics which drive the deep motion in recent eddy-resolving ocean circulation studies (e.g., Holland and Rhines, 1980), and may be contrasted with the results of Pedlosky (1965) and Veronis (1966) for spatially broad, time-dependent forcing. By considering doubly re-entrant (periodic) and closed basin geometries, the structure and magnitude of the induced circulation is shown to depend most critically on the form of the mean quasi-geostrophic contours (which are free in the periodic geometry yet blocked in the closed basin). In both situations, however, the forced primary wave field may usefully be understood by appeal to the radiation pattern of a time-periodic Greens function and its image in the estern boundary. Author

N84-21016# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology and Physical Oceanography.
RECENT WORK AND THOUGHTS ON EDDY-MEAN FLOW INTERACTION
D. E. Harrison *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 17-31 refs (For primary document see N84-21014 11-48)
(AD-P002651) Avail: NTIS HC A16/MF A01 CSCL 08/3

In order to address the question of the roles of mesoscale eddies in the ocean general circulation it is necessary first to determine the ocean general circulation. Unless this circulation is known well enough to estimate the dominant terms in the mean heat, momentum and vorticity equations, it is not possible to evaluate the eddy turbulence terms--divergence of the eddy heat flux, divergence of the Reynolds stress tensor and curl of the divergence of the Reynolds stress tensor--and one can at best speculate on the basis of fragmentary data or theoretical concepts. Even if the detailed balances of the mean equations are known, it may not be simple to establish the roles of the eddies (viz. the meteorological experience), but the task is almost exclusively inferential if the data are unavailable. As it is now clear that there is substantial low requency variability over most of the ocean, determining the general circulation will be an enormous task.
Author

N84-21017# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
ESTIMATION AND PREDICTION OF OCEANIC EDDY FIELDS
Allan R. Robinson and Wayne G. Leslie *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 33-64 refs (For primary document see N84-21014 11-48)
(Grant NsG5-228; Contract N00014-75-C-0225)
(AD-P002652; US-POLYMODE-CONTRIB-181) Avail: NTIS HC A16/MF A01 CSCL 08/3

A system for the optimal estimation and forecasting synoptic/mesoscale ocean currents is presented consisting of an observational system, a statistical model and a dynamical model. The methodology is developed for the case when the dynamical model is a baroclinic, quasigeostrophic open-ocean model. Issues involved include the synoptic and regular gridding of a synoptic non-uniform data, the construction of composite fields from several data types, and the initialization and verification of the dynamical model. Models for the error fields required for weighted combinations of independent field estimates are obtained from the analysis of an observational system simulation carried out with a large numerical data set generated by the dynamical model; a barotropic example is presented. The statistical model is applied to the POLYMODE Synoptic-Dynamic Experiment (SDE) XBT and current meter data which is successfully assimilated in the dynamical model. Author

N84-21018# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OCEANIC MESOSCALE VARIABILITY AND GENERAL CIRCULATION FROM SATELLITE ALTIMETRY: A STATUS REPORT
Lee-Lueng Fu *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 65-86 refs (For primary document see N84-21014 11-48)
(AD-P002653) Avail: NTIS HC A16/MF A01 CSCL 08/3

Progress on the applications of satellite altimetry from SEASAT and Geos-3 to the study of oceanic mesoscale variability and general circulation is reviewed. The major conclusion for the applications to mesoscale variability is that an optimally designed altimetric mission with a lifetime of several years will improve our knowledge of the global mesoscale variability to an extent unattainable by any other practical means. The proposed Topex mission will allow one to view the global oceanic variability in such a wide range of periods and wavelengths: from 20 days to 3

to 5 years; from 50 to 10,000 km. However, the goal of determining the general circulation cannot be achieved by a single altimetric mission, because a highly accurate geoid needs to be determined independently. The scenario of the combination of Topex with Gravsat, a gravity mission that will give accurate geoid information, will allow the global general circulation to be determined at scales as small as 100 km. Areas of research needing to be performed with existing altimeter data are also discussed. Author

N84-21019# Washington Univ., Seattle. Dept. of Atmospheric Sciences.
EDDY: MEAN FLOW INTERACTION DIAGNOSTICS
James R. Holton *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 87-95 refs (For primary document see N84-21014 11-48)
(Grant NSF ATM-79-24687)
(AD-P002654) Avail: NTIS HC A16/MF A01 CSCL 08/3

Recent development in the diagnosis of mean flow forcing by quasi-geostrophic eddies are reviewed. The so-called Eliassen-Palm flux, which has been used to diagnose the forcing of the zonal mean wind by stationary waves, has recently been extended to three-dimensional eddy-mean flow interactions by Hoskins. This work may provide a framework for understanding the driving of mean flows by transient eddies in the atmosphere and the oceans. Author

N84-21020# National Center for Atmospheric Research, Boulder, Colo.
SIMULATION OF MIDLATITUDE VARIABILITY
William R. Holland *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 97-112 refs (For primary document see N84-21014 11-48)
(AD-P002655) Avail: NTIS HC A16/MF A01 CSCL 08/3

Models of eddy resolved ocean circulation have begun to aid in rationalizing observations from midlatitude gyres. In particularly, enhanced transport of the western boundary current and its extension, patterns of eddy energy, the structure of deep abyssal mean gyres, the nature of the recirculation regime, and regions of homogenized potential vorticity in observed gyres all have important analogues in models. Such models then can be extremely useful in unraveling the underlying mechanism by which large scale midlatitude gyres reach a statistical equilibrium. Author

N84-21021# Hawaii Inst. of Geophysics, Honolulu.
EVIDENCE FOR THE DIRECT ATMOSPHERIC FORCING OF MID-OCEAN EDDIES
Peter Muller *In its* The Role of Eddies in the Gen. Ocean Circulation 1983 p 113-127 refs (For primary document see N84-21014 11-48)
(AD-P002656) Avail: NTIS HC A16/MF A01 CSCL 08/3

Evidence for the direct atmospheric forcing of oceanic synoptic-scale motions is reviewed. The evidence comes from new insights into the structure of the atmospheric forcing fields, observations of the Ekman pumping velocity, model calculations, coherence observations, and seasonal modulation. The tentative conclusion is that a substantial part of the mid-ocean eddy field is directly forced by fluctuations in the atmospheric wind stress. The oceanic synoptic-scale variability might hence be viewed as consisting of a random, low-level, homogeneous background field that is atmospherically forced, and on which are superimposed well-identifiable, energetic eddies, rings, and meanders that are caused by current instabilities. Author

N84-21022# Scripps Institution of Oceanography, La Jolla, Calif. Marine Physical Lab.
VENTILATED AND UNVENTILATED MODELS OF THE WIND-DRIVEN CIRCULATION
W. R. Young *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 129-156 refs (For primary document see N84-21014 11-48)
(AD-P002657) Avail: NTIS HC A16/MF A01 CSCL 08/3

The quasigeostrophic theory of the wind-driven circulation given by Rhines and Young (1982a) is extended to take account of strong isopycnal displacements. Thus the quasigeostrophic approximation is abandoned. Instead exact solutions of the planetary geostrophic equations which satisfy both horizontal and vertical boundary conditions are presented. It is shown that the planetary geostrophic equations have an infinite number of solutions, all of which satisfy identical boundary conditions. Other physical process, not explicit in the planetary geostrophic equations themselves, must be considered to decide which solutions is relevant to the real ocean. To clearly illustrate this lack of uniqueness two solutions are discussed in detail. The first solution is a development of the model given by Luyten, Pdelosky and Stommel (1982). The second solution is a development of the model given by Rhines and Young (1982a). Both solutions satisfy the same boundary conditions but have qualitatively different flow patterns. It is argued that the latter solution (which is based on the assumption that potential vorticity is homogenized) is more realistic. Author

N84-21023# Scripps Institution of Oceanography, La Jolla, Calif.
HAMILTON'S PRINCIPLE AS THE BASIS FOR OCEAN CIRCULATION MODELS
Rick Salmon *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 157-161 refs (For primary document see N84-21014 11-48)
(AD-P002658) Avail: NTIS HC A16/MF A01 CSCL 08/3

Hamilton's principle of mechanics governs the motion of the geophysical fluids. As a statement of dynamical law, it has the following practical advantages over the more conventional Eulerian formulation of fluid dynamics: This paper will demonstrate how Hamilton's principle permits useful numerical approximations to the equations governing the motion of a shallow rotating fluid blob Salmon (1982) used a similar model system for a numerical study of the ocean's main thermocline. However, the methods described here are distinctly superior to those of the earlier paper. The new methods generalize easily to continuously stratified and multi-layer flows. Author

N84-21024# Hawaii Inst. of Geophysics, Honolulu.
ON THE DRIVING OF OCEAN CURRENTS BY ROSSBY WAVES
Lorenz Magaard *In its* The Role of Eddies in the Gen. Ocean Circulation 1983 p 163-174 refs (For primary document see N84-21014 11-48)
(AD-P002659) Avail: NTIS HC A16/MF A01 CSCL 08/3

A Rossby wave driven Eulerian mean flow was calculated along the Hawaiian Ridge which compares reasonably well with a current that was inferred from a weak historical temperature data base. Author

N84-21025# Woods Hole Oceanographic Institution, Mass.
OBSERVATIONAL EVIDENCE FOR AN EDDY-DRIVEN DEEP CIRCULATION IN THE NORTH ATLANTIC
Nelson G. Hogg *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 175-198 refs (For primary document see N84-21014 11-48)
(AD-P002660) Avail: NTIS HC A16/MF A01 CSCL 08/3

Evidence from long term moorings and water properties in the North West Atlantic is presented which suggests that there are two components to the deep, subthermocline circulation. Inshore of the 4000-m isobath is the Deep Western Boundary Current, relatively rich in anthropogenically derived material while offshore is a deep recirculating flow composed of one or more gyres transporting perhaps 4 times as much water as the Deep Western Boundary Current. The recirculating flows are similar in scale to those described from numerical models by Holland and Rhines (1980) although the flow under the Gulf Stream is in the opposite direction. The thermocline heat flux in the Gulf Stream recirculation is southward and down the mean temperature gradient. This causes a thickness flux also toward the south which is of comparable magnitude to the relative vorticity flux and, therefore, possibly the driving force for the deep mean circulation. It appears that this thickness flux is driven by spontaneous baroclinic instability of the mean flow. Author

N84-21026# National Center for Atmospheric Research, Boulder, Colo.
ON THE MEAN DYNAMICAL BALANCES OF THE GULF STREAM RECIRCULATION ZONE
James C. McWilliams *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 199-239 refs (For primary document see N84-21014 11-48)
(AD-P002661) Avail: NTIS HC A16/MF A01 CSCL 08/3

The time mean circulation is analyzed at a site on the southern edge of the Gulf Stream Recirculation Zone (31 N, 70 W) from data taken in the POLYMODE Local Dynamics Experiment. Additional mean quantities are described from a combination of dynamical assertions and inferences. The mean vorticity balance is examined to infer the mean vertical velocity and eddy relative vorticity flux divergence. The vertical velocity is found to be mostly upward and an order of magnitude larger than the downward surface Ekman pumping. In the mean heat, salt, density, and potential vorticity budgets, the mean advections of these quantities are non-zero, and substantial eddy flux divergences are again required for balance. These are inferred to be primarily associated with mesoscale eddies. The corresponding horizontal eddy diffusivities for these quantities are large (approx. 10 billion sq cm/s) over an extensive depth range, from the surface to at least 4000 m. As assessment is also made of the likelihood of a homogeneous potential vorticity layer in the recirculation Zone. From our estimates of the local potential vorticity gradients, there is no clearly indicated zero gradient layer, and the qualitative features of our local estimates are consistent with the larger-scale analysis of McDowell et al. Author

N84-21027# Massachusetts Inst. of Tech., Cambridge. Dept. of Meteorology and Physical Oceanography.
THE IMPACT OF GULF STREAM RINGS UPON THE SLOPE WATER
Glenn R. Flierl *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 241-263 refs (For primary document see N84-21014 11-48)
(Grant NOAA-NA82RAD00001)
(AD-P002662) Avail: NTIS HC A16/MF A01 CSCL 08/3

Gulf stream warm core rings are the dominant form of mesoscale activity in the Slope Water region between the Gulf Stream and the continental shelf. Simple scale arguments suggest that the contributions of the 4 to 5 rings formed per year in this region could be very important in the heat, salt, and vorticity balance in the Slope Water. In this paper, we attempt to go beyond scale estimates and to derive approximations which suggest the magnitude of ring-carried and ring-influenced transport of a passive scalar in the Slope. GRA

N84-21028# Rhode Island Univ., Kingston. School of Oceanography.
STUDIES OF THE VELOCITY STRUCTURE OF THE GULF STREAM EAST OF CAPE HATTERAS
Thomas Rossby *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 265-274 refs (For primary document see N84-21014 11-48)
(AD-P002663) Avail: NTIS HC A16/MF A01 CSCL 08/3

Between September 1980 and May 1983 seventeen biomonthly sections of velocity and temperature will have been obtained across the Gulf Stream 200 km downstream from Cape Hatteras. Assuming the last cruise goes well, we will have fourteen complete sections of high quality, and several more from the central part of the Stream. By summer 1983 the raw data will have been fully edited, calibrated and organized for systematic analyses. Preliminary analysis of the first eight transects gives a mean transport of 78 + or - 11 Sv between the surface and 2000 m. The standard deviation is between sections. This mean appears to be quite a bit smaller than the 91 Sv we estimate from Worthington's book (1976) assuming a reference velocity of 4.5 cm/s at 2000 m. Author

N84-21029# Kiel Univ. (West Germany). Inst. fuer Meereskunde.
THE EDDY FIELD OF THE CENTRAL NORTH ATLANTIC
Wolfgang Kraus *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 275-282 refs (For primary document see N84-21014 11-48)
(AD-P002664) Avail: NTIS HC A16/MF A01 CSCL 08/3

Sixty-eight satellite tracked buoys were released in the western and central North Atlantic during 1981 and 1982. Mean velocity values and the variance about the mean were calculated for 20 selected areas. The mean velocities confirm the large scale gyre circulation. The velocity variance decreases toward the east and south. East of the Mid-Atlantic Ridge the eddy kinetic energy reaches values of about 200 sq cm/s at 500 N, but only 50 sq cm/s at 30 N. Author

N84-21030# Scripps Institution of Oceanography, La Jolla, Calif.
ANNUAL AND INTERANNUAL VARIABILITY IN THE KUROSHIO CURRENT SYSTEM
Keisuke Mizuno (Tohoku Regional Fisheries Research Lab.) and Warren B. White *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 283-310 refs (For primary document see N84-21014 11-48)
(Contract N00014-75-C-0152)
(AD-P002665) Avail: NTIS HC A16/MF A01 CSCL 08/3

Individual, seasonal, 300 m temperature maps were constructed over the Kuroshio Current System from 130 E to 170 W, for a four year period from summer 1976 through spring 1980, by using TRANSPAC XBT data and JODC temperature/depth data. Quasi-stationary meanders in the Kuroshio Current System occurred at 137 E (i.e., Kuroshio Meander), at 144 E and 150 E (i.e., lee wave meanders), and near 160 E (i.e., meander over the Shatsky Rise). A composite of the paths of the Kuroshio (i.e., the 12 C isotherm) from the individual seasonal maps, and the total variance map, finds nodes (i.e., minima) and anti-nodes (i.e., maxima) of variability to have existed along the mean Kuroshio path. The anti-nodes coincided with the location of the quasi-stationary meanders, the nodes in between Zonal propagation of temperature anomalies accounted for 20 to 30% of the total interannual variance. These temperature anomalies propagated eastward at 0.5 to 1.5 cm/sec in the region 140 to 155 E, and westward at -1 to -2 cm/sec in the region 155 E to 175 W. Author

N84-21031# Institute of Ocean Sciences, Sidney (British Columbia).
EDDY HEAT FLUX IN THE NORTH PACIFIC
Andrew Bennett *In* Hawaii Inst. Geophys. The Role of Eddies in the Gen. Ocean Circulation 1983 p 311-318 refs (For primary document see N84-21014 11-48)
(AD-P002666) Avail: NTIS HC A16/MF A01 CSCL 08/3

Estimates of meridonal heat flux in the North Atlantic are reviewed. The 1976 to 1980 TRANSPAC XBT data is used to estimate transient and standing eddy heat fluxes above 400 dbar. The latter is marginally significant, due to an offshore meander in the Kuroshio path. Author

N84-21032# Washington Univ., Seattle. School of Oceanography.
THE WEST SPITSBERGEN CURRENT: TRANSPORT, FORCING, AND VARIABILITY Ph.D. Thesis
Dennis Joe Hanzlick 1983 140 p
(Contract N00014-75-C-0893; Grants NSF DPP-80-09304; NSF DPP-81-00153)
(AD-A137532; AD-E301319; TR-24) Avail: NTIS HC A07/MF A01 CSCL 08/3

The West Spitsbergen Current is commonly considered to be the northern extension of the Norwegian Atlantic Current, and it forms one of the branches of the circulation pattern of the Greenland-Norwegian sea system. It flows northward along the continental margin west of Spitsbergen, entering the Arctic basin on the east side of the Greenland-Spitsbergen passage (Fram Strait). Previous work (Aagaard and Greisman, 1975) has shown that it provides the major component in the mass and heat balances of the Polar Basin. Beginning in summer 1976, moored current and temperature recorders have been deployed in the WSC at

79 N, and the data records from 1976-79 and 1980-81 provide the basis for this work. The data have been used to estimate the volume and heat transports by the current and to define the structure and variability of the flow. In addition to the presentation of basic results, there is a discussion of the dynamics of the current with emphasis on explaining the length and time scales of the observed variability and on ascertaining the nature of the forces driving the flow. GRA

N84-21033# Naval Ocean Research and Development Activity, Bay St. Louis, Miss. Ocean Science and Technology Lab.
SHORT TERM MEASUREMENTS OF OMNIDIRECTIONAL AMBIENT NOISE IN THE SOUTHWEST ATLANTIC DURING JANUARY 1981 Final Report
G. B. Morris, J. M. Berkson, and T. E. Stixrud (Naval Ocean Systems Center) Jul. 1983 47 p
(AD-A137666; AD-E000561; NORDA-TN-183) Avail: NTIS HC A03/MF A01 CSCL 20/1

Short-term omnidirectional measurements of ambient noise below 1 kHz were made for 14 deep-water stations in the Southwest Atlantic off the coast of South America during January 1981. At the lower frequencies (10 to 150 Hz) the noise levels agree with the middle range of the prediction curves for normal shipping densities in the northern oceans as reported by Wenz (1962). No consistent major geographical or physiographic dependence of the ambient noise levels was found for these reported measurements. The levels reported here for this South Atlantic region are generally higher than those found for the South Pacific regions. This result was unexpected as the total shipping in the southern ocean basins is considerably less than that in the northern ocean basis. One possible explanation of why the noise levels are high is that the sources from a high density shipping lane along the east coast of South America may have been effectively coupled to the main propagation paths in the deep sound channel. GRA

N84-21034# Skidaway Inst. of Oceanography, Savannah, Ga.
COORDINATION: SOUTHEAST CONTINENTAL SHELF STUDIES Progress Report
David W. Menzel 12 Dec. 1983 31 p refs
(Contract DE-AS09-76EV-00901)
(DE84-004165; DOE/EV-00901/7) Avail: NTIS HC A03/MF A01

The oceanography of the South Atlantic Bight was studied. The studies include: (1) a summary of past research; (2) use of the Savannah River navigational light tower as a meteorological/oceanographic monitoring station; and (3) use of research vessels. The influences of the Gulf Stream and other focusing functions on physical, chemical and biological processes of the outer and midcontinental shelf are described. DOE

N84-21035# Skidaway Inst. of Oceanography, Savannah, Ga.
BIOLOGICAL PROCESSES IN THE WATER COLUMN OF THE SOUTH ATLANTIC BIGHT Progress Report, Jun. 1982 - Jun. 1984
Gustav-Adolf Paffenhofer and James A. Yoder 1 Dec. 1983 21 p refs
(Contract DE-AS09-76EV-00936)
(DE84-004336; DOE/EV-00936/7) Avail: NTIS HC A02/MF A01

Phytoplankton dynamics and related processes in nearshore waters were investigated. Work on the limitation of phytoplankton growth by nutrients in nearshore waters, the inhibitioon of the rate of phytoplankton production by wind and tide induced vertical mixing within the turbid nearshore waters, the influence of the coastal frontal zone on the spatial distributions of photoplankton biomass, primary production and plant nutrients, and zooplankton abundance distribution and production in relation to hydrographic variables is summarized. DOE

N84-21036# National Oceanic and Atmospheric Administration, Seattle, Wash. Pacific Marine Environmental Lab.
VERTICAL SECTIONS OF OXYGEN, PHOSPHATE, SILICATE, NITRATE AND NITRITE FROM THE NORPAX SHUTTLE EXPERIMENT
B. A. Taft and P. Kovala Aug. 1983 129 p refs
(PB84-138759; NOAA-DR-ERL-PMEL-10; Contrib-670;
NOAA-84010301) Avail: NTIS HC A07/MF A01 CSCL 08J

The NORPAX Hawaii-Tahiti Shuttle Experiment was carried out in the central Pacific (158, 153, and 150 degrees) during the period February 1979-June 1980. This report covers the dissolved oxygen and inorganic phosphate, silicate, nitrate and nitrite measurements made. Vertical sections of each property are presented for above three meridians. Author (GRA)

N84-21037# Massachusetts Inst. of Tech., Cambridge. Marine Industry Advisory Services.
APPLICATION OF MARINE ACOUSTIC SYSTEMS
1 Aug. 1983 53 p refs Revised
(Grant NA81AA-D-00069)
(PB84-141381; MITSG-83-10-Rev; Opportunity-Brief-33-Rev;
NOAA-84010406-Rev) Avail: NTIS HC A04/MF A01 CSCL 08B

Ocean acoustic tomography is immediately useful to weather researchers and oceanographers interested in the internal processes of the ocean. With additional development, people involved with offshore resource development. Ocean Thermal Energy Conversion (OTEC) and offshore oil, for example, would benefit by being able to measure in situ, deep ocean currents and to measure currents in such anomalies as the Gulf rings. Ocean acoustic tomography is similar to the CAT (Computer Aided Tomography) scan which uses X-rays for imaging parts of the body. Ocean acoustic tomography deploys underwater sound waves to produce a picture of the inner ocean, and it also permits synoptic measurements over a large area without requiring a fleet of oceanographic vessels. GRA

N84-20895# Joint Publications Research Service, Arlington, Va.
SYMPOSIUM ON OCEAN MONITORING HELD IN TALLINN
In its USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 6-7 Transl. into ENGLISH from Sov. Est. (USSR), 2 Oct. 1983 p 3 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

N84-20896# Joint Publications Research Service, Arlington, Va.
SEISMOLOGICAL MEASUREMENTS ON OCEAN FLOOR
S. L. Solovyev *In its* USSR Rept.: Earth Sci. (JPRS-UES-84-003) 29 Mar. 1984 p 13-21 Transl. into ENGLISH from Zemlya i Vselennaya (USSR), no. 4, Jul. - Aug. 1983 p 17-21 (For primary document see N84-20891 11-42)
Copyright. Avail: NTIS HC A04

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N84-21038# Materials Research Labs., Melbourne (Australia).
MARINE FOULING AT HMAS STIRLING, WESTERN AUSTRALIA
Ian Dunstan Jan. 1984 25 p refs
(MRL-R-914; AR-003-895) Avail: NTIS HC A02/MF A01

The results of a study of marine fouling at HMAS STIRLING in Careening Bay, Western Australia are presented. Marked seasonal variation in the settlement of fouling organisms was noted, with the heaviest settlement of most species coinciding with the high water temperatures of the summer months. The fouling community developed in several stages dependent upon temporal variations in settlement and growth of organisms. Established fouling underwent annual changes due to the heavy annual summer settlement of numerous species, the late winter influx of Mytilis edulis and the periodic fall-off of large mature organisms. The dominant marine fouling species at HMAS STRILING were different to those prominent in the fouling at the east Australian Naval establishments. S.L.

N84-21039# Materials Research Labs., Melbourne (Australia).
CHECKLIST AND BIBLIOGRAPHY OF BENTHIC MARINE MACROALGAE RECORDED FROM NORTHERN AUSTRALIA. 1:

RHODOPHYTA
John A. Lewis Jan. 1984 102 p
(MRL-R-912; AR-003-893) Avail: NTIS HC A06/MF A01

Published records of benthic marine red algae (Rhodophyta) from tropical and subtropical Australia are systematically listed with full bibliographic details and collection localities. More than four hundred taxa are included and, for each, references to the original description and, where possible, references to an illustration are also given. Author

N84-21040*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE STATION MEDICAL SCIENCES CONCEPTS
John A. Mason, ed. and Phillip C. Johnson, Jr., ed. Feb. 1984 79 p refs
(NASA-TM-58255; NAS 1.15:58255) Avail: NTIS HC A05/MF A01 CSCL 06C

Current life sciences concepts relating to Space Station are presented including the following: research, extravehicular activity, biobehavioral considerations, medical care, maintenance of dental health, maintaining health through physical conditioning and countermeasures, protection from radiation, atmospheric contamination control, atmospheric composition, noise pollution, food supply and service, clothing and furnishings, and educational program possibilities. Information on the current status of Soviet Space Stations is contained. Author

N84-21041# Calspan Corp., Buffalo, N. Y. Applied Technology Group.
MITIGATION OF BIOFOULING USING COATINGS Final Annual Report
M. S. Fornalik, R. E. Baier, A. E. Meyer, and R. W. King 21 Dec. 1983 53 p refs
(Contract DE-AC02-80ER-10766)
(DE84-006112; DOE/ER-10766/12; FAR-3; C-6782-M-12) Avail: NTIS HC A04/MF A01

A 3 year project which summarizes earlier findings in seawater and brackish water systems which presents detailed new data from field tests in fresh cooling water of the Niagara River is reported. The results are similar for all systems tested in showing that deliberate modification of the initial material surface qualities, using thin film coatings in short term, proof of principle trials, can significantly reduce the retention of efficiency degrading biofouling layers and mineral scales while retarding corrosion. The best coating evaluated has a critical surface tension of 22 milliNewtons per meter. The serious environmental need to reduce dependence on toxic fouling control techniques such as use of metallic poisons and/or chlorination in industrial heat exchange circuits is recognized. DOE

N84-21042# California Univ., Livermore. Lawrence Livermore Lab. Biomedical Sciences Div.
STATISTICAL ANALYSIS OF HIGH SCE FREQUENCY CELLS IN HUMAN LYMPHOCYTES
Dan H. Moore, II and Anthony V. Carrano Dec. 1983 24 p refs Presented at the Intern. Symp. on Sister Chromatic Exchange, Upton, N.Y., 4-8 Dec. 1983
(Contract W-7405-eng-48)
(DE84-005433; UCRL-89891; CONF-831261-1) Avail: NTIS HC A02/MF A01

The existence of a subpopulation of lymphocytes in which genetic damage persists was identified in experiments on rabbits injected with low levels of mitomycin C. This led to the suggestion that an important parameter to quantify after exposure to a possibly harmful agent may be the proportion of cells with high sister chromatid exchange (SCE) frequency, i.e., high frequency cells (HFCs). In the research reported here, the statistical properties of HFCs are described, particularly their utility in detecting low levels of genetic damage which may be undetected by a simple t-test comparing the means of two samples of SCEs. DOE

52 AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

N84-21043*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: 1983 CUMULATIVE INDEX
Jan. 1984 310 p
(NASA-SP-7011(254); NAS 1.21:7011(254)) Avail: NTIS HC $12.00 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 242 through 253 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes six indexes--subject, personal author, corporate source, contract number, report number, and accession number. Author

N84-21044*# National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1984 67 p
(NASA-SP-7011(256); NAS 1.21:7011(256)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 224 reports, articles and other documents introduced into the NASA scientific and technical information system in February 1984. Author

N84-21045*# Texas Univ. Health Science Center, Houston. Dept. of Surgery.
SYSTEM FOR THE MANAGEMENT OF TRAUMA AND EMERGENCY SURGERY IN SPACE Final Report
Bruce Houtchens 5 Dec. 1984 124 p refs
(Contract NASw-3744)
(NASA-CR-175439; NAS 1.26:175439) Avail: NTIS HC A06/MF A01 CSCL 06E

The need to develop a systems approach to the management of trauma and other major clinical medical events in space along with appropriate development and evaluation of surgical techniques and required hardware was investigated. A prototype zero gravity surgical module was constructed and tested aboard a KC-135 aircraft during parabolic arc zero G flight. To insure parity of quality care to that available on Earth, it was recommended that a clinical medical and bioengineering advisory committee define and help develop the necessary components of the clinical medical care system for the space station and lunar base. Key components of the system are aerospace surgical training, medical equipment development, including support hardware and software, rapid access to a network of specialty expertise, and continued research and development. M.A.C.

N84-21046*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES IN BONE DEMINERALIZATION, PHASE 3 Final Report
Sue Ann Anderson, ed. and Stanton H. Cohn, ed. (Brookhaven National Lab.) Dec. 1983 71 p refs
(Contract NASw-3728)
Avail: NTIS HC A04/MF A01 CSCL 06P

Bone demineralization, calcium responses to weightlessness, endocrine responses to weightlessness, mechanisms of bone loss, biomedical research, pathogenesis, and endocrine effects are discussed. Author

N84-21047# Army Intelligence and Threat Analysis Center, Arlington, Va.
MILITARY MEDICAL JOURNAL, NO. 5, MAY 1983
Feb. 1984 130 p refs Transl. into ENGLISH of Voyenno-Med. Zh. (Moscow), no. 5, May 1983
(L-2404) Avail: NTIS HC A07/MF A01

Several areas of clinical medicine are addressed including aeronautical and naval medicine, therapeutic and prophylactic

questions, education of health workers, hygiene, physiology, and epidemiology. For individual titles, see N84-21048 through N84-21049.

N84-21048# Army Intelligence and Threat Analysis Center, Arlington, Va.
ASPECTS OF MEDICAL EXAMINATIONS OF AIRMEN WITH REGARD TO EYE DISEASES
L. M. Asyyev *In its* Mil. Med. J., No. 5, May 1983 Feb. 1984 p 68-70 Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 5, May 1983 (For primary document see N84-21047 11-52)
Avail: NTIS HC A07/MF A01

The assessment of fitness for duty of airmen with regard to the condition of their eyes is based on an individual approach. The fitness for duty of each person examined is determined with consideration of the state of his visual functions, his professional experience and qualifications. The resolving power of the eye has special importance in this assessment. During medical examination of airmen, the ophthalmologist should make clear how the subject's state of health will effect his flight duty, whether or not a basis (eye) or a concomitant (somatic) disease is progressive and what is the prognosis of them. It is very important to establish how this or that deviation in the state of health wll affect performance of flight duty and whether this condition could contribute to breakdowns or flight accidents. Author

N84-21049# Army Intelligence and Threat Analysis Center, Arlington, Va.
ANTHROPOMETRIC INDICATORS OF SUBMARINERS
V. V. Polonskiy and S. V. Korzh *In its* Mil. Med. J., No. 5, May 1983 Feb. 1984 p 71-73 Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 5, May 1983 (For primary document see N84-21047 11-52)
Avail: NTIS HC A07/MF A01

Anthropmetric indicators are one of the criteria used to determine the ergonomic parameters of control panels, spaces and equipment at the work stations of operator-specialists as well as the surroundings of human habitation. These characteristics must be restudied periodically since the conditions and criteria of occupational selection are changing and, the change in these parameters among the population is accelerating. Comparison of results of anthropometric studies carried out in the USSR with data from analogous investigations among populations of Western European countries and analysis of factors stimulating acceleration of changes in these indicators in our country show that this process will continue. The anthropometric study of submariners and the comparison of the data obtained with results of data from previous observations and also with data concerning the present-day civilian population show the need for periodic (about once every 10 years) anthropometric studies of servicemen. Author

N84-21050# Army Intelligence and Threat Analysis Center, Arlington, Va.
MILITARY MEDICAL JOURNAL, NO. 11, NOVEMBER 1983
Nov. 1983 141 p refs Transl. into ENGLISH of Voyenno-Med. Zh. (Moscow), no. 11, Nov. 1983
(L-2539) Avail: NTIS HC A07/MF A01

Several areas of clinical medicine are addressed including immunology, workloads (psychophysiology), pilot performance, disease predictions, tomography, sanitation, vascular disease, and microsurgery. For individual titles, see N84-21051 through N84-21052.

N84-21051# Army Intelligence and Threat Analysis Center, Arlington, Va.
METHODS AND MEANS OF IMPROVING THE WORKING CAPABILITY OF FLIGHT PERSONNEL
V. A. Vodrov *In its* Mil. Med. J., No. 11, Nov. 1983 Nov. 1983 p 58-64 refs Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 11, 1983 p 40-44 (For primary document see N84-21050 11-52)
Avail: NTIS HC A07/MF A01

Working capability is one of the most important categories of activity of flight personnel. The successfulness of performing the flight mission, flight safety, and flight longevity are determined by work capability. The necessity to ensure high effectiveness of using aircraft, the complexity and responsibility of flight activity require creating conditions for maintaining the working capability of personnel at the necessary level. The nature and conditions of the pilot on the ground and in the air lead in a number of cases to a significant decrease in working capability. The use of scientific development of means and methods ensures high working capability of flight personnel and their practical use during the creation and operation of aviation equipment is an extremely important one. The working capability of the pilot is determined by his professional experience, training, and his personality, by the nature of demands, settings, and motives for activity, and finally, by the functional condition of the body and the value of its reserve potentials. Therefore, controlling the functional condition of pilots, mainly its evaluation and correction, is the task of military-aviation physicians. Author

N84-21052# Army Intelligence and Threat Analysis Center, Arlington, Va.
SOME IMMUNOLOGICAL MECHANISMS OF ADAPTATION OF SEAMEN TO CONDITIONS OF LOW LATITUDE SAILING
I. A. Sapov *In its* Mil. Med. J., No. 11, Nov. 1983 Nov. 1983 p 65-67 refs Transl. into ENGLISH from Voyenno-Med. Zh. (USSR), no. 11, 1983 p 44-45 (For primary document see N84-21050 11-52)
Avail: NTIS HC A07/MF A01

One of the most important homeostatic systems of the body is the immune system. Therefore, a great deal of importance is given to studying the immunologically foundations of vital activity as one of the leading trends in basic theoretical investigations of the problem of adaptation. The functional state of the immune system of sailors during their adaptation to conditions of prolonged sailing in the subtropical climatic zone was studied. The examinations were made before the crew went to sea (73 men), at the end of a long voyage (53 men), and after 35 days of rest (50 men). All of the examined men was healthy men ranging in age from 18 to 24 years. Occupational factors inherent to the work performed by sailors have the decisive effect on the immune system during a prolonged voyage in the lower latitudes. This is confirmed by the nearly complete recovery of immunological reaction and the decrease in the morbidity of ship specialists after rest. This took place under exactly the same climatic conditions as the previous period of the voyage. Giving ship crews rest after a long voyage is an important preventive and rehabilitative measure facilitating preservation of the sailors' health. Author

N84-21053*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
METHOD FOR THERMAL MONITORING SUBCUTANEOUS TISSUE Patent Application
Joseph S. Heyman and Gary H. Brandenburg, inventors (to NASA) Filed 22 Feb. 1984 10 p
(NASA-Case-LAR-13028-1; US-Patent-Appl-SN-582492) Avail: NTIS HC A02/MF A01 CSCL 06B

A noninvasive accurate method for measuring the temperature of tissue beneath the surface of a living body is described. Ultrasonic signals are directed into beads of a material inserted into the tissue with a syringe. The reflected signals indicate the acoustic impedance or resonance frequency of the beads which in turn indicates the temperature of the tissue. A range of temperatures around the melting temperature of the material can be measured by this method. NASA

N84-21054# Pacifica-Sierra Research Corp., Los Angeles, Calif.
INITIAL HUMAN RESPONSE TO NUCLEAR RADIATION Technical Report
George H. Anno, Harold L. Brode, and Ruth Washton-Brown 1 Apr. 1982 92 p
(Contract DNA001-81-C-0067; P99-QAXD)
(AD-A137543; AD-E301319; PSR-N-477; DNA-TR-81-237) Avail: NTIS HC A05/MF A01 CSCL 06/18

This report documents the results of the first phase of an investigation into the nuclear effects on military troop performance. Both signs and symptoms associated with radiation sickness were examined to develop models of human response to radiation as a function of dose, time and symptom severity. Data on the early symptomatic effects of radiation exposure were gathered from some 150 books, articles and monographs. The analysis of this data focused on human data collected from the victims of nuclear accidents and therapy patients. Data from the survivors of the Japanese atomic bombs were excluded because of data imprecision and questions raised about the accuracy of reported exposure levels. A hypothetical exposed population was divided of reported groups based on the sensitivity of individuals to radiation: hyper-, hypo-, and normsensitives. The population was also classified by the severity of their symptoms; unaffected and mildly, moderately and severely affected. Using this data, relationships for the onset time and duration of acute symptoms after a given radiation dose were developed. Conceptual models were then derived for (1) individual response as a function of dose, time after exposure, and severity of symptoms, (2) population response (percentage affected in various degrees), and (3) links between individual and population responses. GRA

N84-21055# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.

A STUDY OF LOW LEVEL LASER RETINAL DAMAGE Annual Progress Report, 1 Feb. 1983 - 31 Jan. 1984

B. F. Hochheimer 1 Feb. 1984 55 p

(Contract N00024-83-C-5301)

(AD-A137664; AD-E000561) Avail: NTIS HC A04/MF A01 CSCL 06/18

The general objective of this program is to document changes in the retina due to very low laser irradiation. We have two primary aims. One is to develop and improve methods that can be used, in vivo, to objectively determine changes that occur in the retina from laser irradiation. The second is to determine the mechanisms that cause these retinal changes. During this past year we have: (1) Measured the change in retinal reflectivity during YAG and Argon Ion laser burn periods. (2) Determined the fluorescence decay time of fluorescein dye in water, blood and monkey retinas. (3) Obtained estimates of the amount of scattered light in the eye in the green and red spectral regions. GRA

N84-21056# Georgia Inst. of Tech., Atlanta. Biomedical Research Div.

RADIOFREQUENCY RADIATION EFFECTS ON EXCITABLE TISSUES Final Report, 1 Jun. 1981 - 30 Oct. 1982

Ronald L. Seaman and Robert L. DeHaan (Emory Univ., Atlanta, Ga.) Nov. 1983 111 p

(Contract F33615-81-K-0618; AF Proj. 2312)

(AD-A137772; GIT/EES-A-2974; USAFSAM-TR-83-36) Avail: NTIS HC A06/MF A01 CSCL 06/18

Spheroidal aggregates of cultured chick cardiac cells were used to study effects of 2450-MHz radiofrequency radiation (RFR) on excitable membranes. Membrane voltage noise was recorded simultaneously with two microelectrodes. Preparation bulk temperature ws 37 + or - 0.2 C, and temperature at the aggregate was less than 0.9 C above this during RFR exposures of 2- and 3-min durations. Specific absorption rate (SAR) was between 1 and 231 mW/g, and both continuous-wave (CW) and pulse-modulated (PW, 5 mcirosec at 100 pps) RFR were applied using an open-ended coaxial exposure device. Membrane voltage fluctuations, in the form of noise and microspike event and membrane impedance were observed before, during, and after RFR exposures. No RFR effect was seen on membrane impedance viewed as parallel resistance and capacitance. The relation of membrane voltage noise power (0.1-1.0 Hz) to membrane potential was significantly altered during the first half of 3-min exposures to 1-5 and 15-30 mW/g CW RFR. This was found by using two-tailed t-tests to test the difference in slopes between least-squares linear regression fits of data from different RFR conditions with the significance level set at $P<0.05$. Although microspikes seemed to contribute to this RFR effect on noise, there was no significant difference (two-tailed t-test, $P<0.05$) in frequency of occurrence of microspikes greater than 0.2 mV for any RFR exposure condition. GRA

N84-21057# California Univ., Santa Barbara. Inst. of Environmental Stress.

PHYSIOLOGICAL ADJUSTMENTS TO HEMORRHAGE, ALTITUDE, AND WORK Final Scientific Report, 1 Dec. 1977 - 31 Aug. 1983

Steven M. Horvath Oct. 1983 16 p

(Grant AF-AFOSR-3534-78; AF Proj. 2312)

(AD-A137781; AFOSR-84-0019TR) Avail: NTIS HC A02/MF A01 CSCL 06/19

This research program has been concerned with evaluating the influence of various stressors, physiological and psychological, on man and subsequently determining the capacity of the individual to successfully adapt to these environmental influences. In the process of these investigations some 42 peer-reviewed manuscripts were published. They have dealt with the responses to exercise, cold and hot environments, hypoxia, toxicological substances, sleep and psychological stresses. The subjects for these studies have included both sexes. In general while some facets of man's adaptability have been resolved, it is clear that numerous problems remain to be investigated. GRA

N84-21058# Texas Univ. Health Science Center, San Antonio. Health Science Center.

THE EFFECTS OF ORGANOPHOSPHORUS ANTICHOLINESTERASE COMPOUNDS ON BRAIN GLUCOSE AND ENERGY METABOLISM Annual Summary Report, 1 Oct. 1981 - 30 Sep. 1982

M. A. Medina and A. L. Miller Jan. 1983 24 p

(Contract DAMD17-81-C-1240; DA Proj. 3M1-62734-A-875)

(AD-A137819) Avail: NTIS HC A02/MF A01 CSCL 06/20

The purpose of these experiments was to determine the effect of an organophosphorus cholinesterase inhibitor, paraoxon, on glucose utilization and the levels of intermediary metabolites in brain. The 24 hr. I.V. LD(50) of paraoxon in rats was 0.764 + or - 0.032 micromol/kg. A dose of 0.8 of the LD(50) did not result in any evidence of hypoxia in rats up to 2 hr. post-injection. The levels of glucose, pyruvate, glutamate, lactate, ATP, and phosphocreatine were determined in the following brain areas: cortex, midbrain, thalamus-basal ganglia, cerebellum and brain stem at 2, 10, 32 or 128 min. after administration of 0.8 or 0.5 of the LD(50) of paraoxon. The only consistent change observed was an elevation of tissue glucose. Injection of 0.8 of the LD(50) of paraoxon resulted in a significant depression in glucose utilization in the cortex for up to 30 min. However this decrease was not observed at 128 min. when the peripheral cholinergic effects were also absent. The diminished glucose utilization may be the cause of the increase in brain glucose observed. The decrease in glucose utilization may be due to an increase in inhibitory cholinergic neuronal activity. GRA

N84-21059# Boston Univ., Mass. Dept. of Mathematics.

DYNAMIC MODELS OF NEURAL SYSTEMS: PROPAGATED SIGNALS, PHOTORECEPTOR TRANSDUCTION, AND CIRCADIAN RHYTHMS Final Scientific Report

Stephen Grossberg Nov. 1983 97 p

(Grant AF-AFOSR-0148-82; AF Proj. 2313)

(AD-A137826; AFOSR-84-0022TR) Avail: NTIS HC A05/MF A01 CSCL 06/16

Three concepts are used to illustrate how a small number of simple mechanisms can generate a wide diversity of complex biological phenomena, as well as parametric experimental tests of the models that simulate these phenomena. One is the classical concept that a membrane equation can model fast electrical responses in cells. The second is the concept that mass action processes can be coupled to the membrane equation as conductance terms. The third is the concept that gating processes can be used to model the mass action dynamics of chemical transmitters. GRA

N84-21060# Duke Univ., Durham, N. C. Lab. for Environmental Research.
DECOMPRESSION MECHANISMS AND DECOMPRESSION SCHEDULE CALCULATIONS Final Report, 1 Nov. 1982 - 31 Oct. 1983
Richard D. Vann 20 Jan. 1984 85 p
(Contract N00014-83-K-0019)
(AD-A137868) Avail: NTIS HC A05/MF A01 CSCL 06/19

A theoretical method has been developed to predict space craft and space suit atmospheres. The method used to analyze stage decompression procedures which have been tested for the Shuttle. The effect of exercise during compression and bottom time has been studied with rats during an 18 minute air dive at 350 fsw. Seventeen resting rats and 27 exercising rats out of 2 groups of 108 rats developed decompression sickness. A method for developing decompression schedules for helium/oxygen and nitrogen/oxygen saturation dives is described. Only one unknown constant is required for each saturation depth and inert gas, and this constant can be estimated from the results of previous saturation dives. Equations are presented for analyzing previous dives and for calculating decompression schedules, and examples of provisional schedules are given. GRA

N84-21061# Army Research Inst. of Environmental Medicine, Natick, Mass. Heat Research Div.
EXERCISE IN THE HEAT. EFFECTS OF SALINE OR BICARBONATE INFUSION
Ralph P. Francesconi and Roger W. Hubbard 1 Dec. 1983 30 p
(DA Proj. 3M1-61102-BS-10)
(AD-A137194; USARIEM-M10/84) Avail: NTIS HC A03/MF A01 CSCL 06/19

Adult, male rats (N=17/group, 300-320 g, physically untrained) were exercised (9.14 m/min) in the heat (35 C) to hyperthermic exhaustion (Tre = 43 C) after infusion of 2 ml of 7.5% sodium bicarbonate (BIC) or 2 ml of 0.9% sodium chloride (SAL). BIC or SAL administration had no effects on endurance when compared with rats receiving no exogenous fluid (CON) while the rate of heat gain was significantly increased in the BIC-treated group. Following exercise, the BIC group manifested significantly decreased hematocrit and plasma protein levels, but exaggerated increments in plasma osmolality. Lactate levels were significantly increased in all three groups with no notable inter-group differences. While venous (v) blood pH and bicarbonate levels were decreased following exercise in the SAL and CON groups, they were unchanged in the BIC group. While vPCO2 was unaffected by fluid administration in all three groups, vPO2 was significantly increased following exercise in the heat in all groups. We concluded from these experiments that while BIC infusion prevented the acidosis and hypobicarbonatemia induced by exercise in the heat to hyperthermic exhaustion, no beneficial effects on physical performance or thermoregulation ensued. GRA

N84-21062# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SUSTAINED INTENSIVE AIR OPERATIONS: PHYSIOLOGICAL AND PERFORMANCE ASPECTS
Loughton, England Nov. 1983 220 p refs In ENGLISH and FRENCH Conf. held in Paris, 18-22 Apr. 1983
(AGARD-CP-338; ISBN-92-835-0343-0) Avail: NTIS HC A10/MF A01

The symposium addressed the aeromedical and human factors aspects of the capabilities of aircrew and ground crew to perform their duties at high intensities at irregular times of the day and night over many days or weeks under military operational conditions. Laboratory studies on the measurement of aircrew workload, the effects of disturbances of circadian rhythms and deprivation of sleep and the use of hypnotics and stimulants to influence sleep and wakefulness are reported. The effects of protective equipment and procedures on air and ground crew with particular reference to fast jet and helicopter operations are examined. Field studies of fatigue, performance and physiological disturbances in aircrew and ground personnel engaged in sustained air operations are described. For individual titles, see N84-21063 through N84-21081.

N84-21063# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CONCEPTUAL FRAMEWORK FOR THE DEVELOPMENT OF WORKLOAD METRICS IN SUSTAINED OPERATIONS **c53**
Robert D. ODonnell (Wright State Univ.) and F. Thomas Eggemeier (Systems Research Labs., Inc.) *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

In sustained operations, the cumulative effect of workload may lead to unpredicted, catastrophic human failure. Workload assessment, however, has suffered from the lack of an overall, standardized framework which would permit development of sensitive, predictive metrics. Such a general framework is developed based on the view that workload is a multiply-determined hypothetical construct conveniently summarizing the interactions which limit task performance. Major task, operator, and response factors are presented, and related to metrics available or being developed for assessing these factors. The framework is then utilized to suggest the broad outlines of a research program leading to standardization of workload assessment in sustained operations environments. M.G.

N84-21064# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Workload and Ergonomics Branch.
THE U.S. AIR FORCE NEUROPHYSIOLOGICAL WORKLOAD TEST BATTERY: CONCEPT AND VALIDATION **c53**
Robert D. ODonnell *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

In order to provide measures of specific human capabilities and resources, the U.S. Air Force Aerospace Medical Research Laboratory is developing workload metrics spanning the entire spectrum, from task analysis through subjective and behavioral measures. In addition, neurophysiological measures have been investigated for a number of years with respect to their sensitivity in assessing workload. As a result of these studies, a test battery consisting of six different electrophysiological measures in eleven different forms was constructed. The tests selected were based on extensive laboratory data which indicated some probability that each measured an aspect of workload and might be appropriate and practical in applied settings. This test battery is currently undergoing validation studies in simulator environments and successfully validated tests will be incorporated into a second generation neurophysiological test battery to be used in field workload assessment. The overall rationale of the tests selected, as well as some of the experimental evidence supporting their use as workload assessment devices are detailed. Validation studies and plans for future test modifications are also presented. M.G.

N84-21065# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Workload and Ergonomics Branch.
BEHAVIORAL AND SUBJECTIVE WORKLOAD METRICS FOR OPERATIONAL ENVIRONMENTS **c53**
Clark A. Shingledecker *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

The assessment of crew performance capability under conditions of sustained intensive air operations requires the use of specialized measures of operator workload which are matched to the nature of the investigation and to the environment in which the workload evaluation must be conducted. In many cases, the effects of severe combined stressors and of aircrew performance requirements on mental workload cannot be studied in the laboratory, and must be addressed in high fidelity simulation or during operational test exercises. The advantages and limitations of traditional subjective report and behavioral measures of workload for application in operational environments are examined. In

addition, efforts at the U.S. Air Force Aerospace Medical Research Laboratory to develop improved field-usable subjective and behavioral secondary task metrics are described. M.G.

N84-21066# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Human Engineering Div.

LABORATORY STUDIES OF AIRCREW CHEMICAL PROTECTIVE ENSEMBLE: EFFECTS ON PILOTS' PERFORMANCE **c54**

Grant R. McMillan, William J. Cody (McDonnell-Douglas Astronautics Co.), and Robert G. Mills *In* AGARD Sustained Intensive Air Operations Nov. 1983 18p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

The results of a U.S. Air Force program designed to quantify the effects of current and near-term chemical protective gear on pilot performance are described. The first phase of the program consisted of a sensitivity analysis to determine which aspects of pilot performance should be evaluated, the anticipated performance decrements, the stress mechanisms presumed to be operating, and the flight simulations required to quantify the effects of the protective ensemble. To date, two full-mission laboratory experiments have been completed. These experiments evaluated the currently fielded USAF aircrew ensemble and a proposed Integrated Chemical Defense System. Reductions in pilot performance were observed with both systems under simulated hot environmental conditions. However, the pilots strongly preferred the Integrated Chemical Defense System's eye-respiratory protective gear. The data suggest that thermal stress, produced by the multiple layer body protective gear, caused the performance reductions. M.G.

N84-21067# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Flugmedizin.

CIRCADIAN RHYTHMS AND SUSTAINED OPERATIONS

H. M. Wegmann and K. E. Klein *In* AGARD Sustained Intensive Air Operations Nov. 1983 7p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

Sustained operations necessarily conflict with the circadian system in several ways: changes in the habitual work-rest cycle, shifts in meal- or sleep-timing, intense activity during night hours, sleep deprivation and disruptions of the normal synchrony between body functions and environment. When these rhythm disturbances affect performance, they become operationally significant. Their consequences are discussed and factors are described which influence the range of performance oscillation. Of particular operational relevance are motivation, sleep and physical exercise. Under certain conditions they can help to overcome deficits in performance and periods of diminished efficiency. M.G.

N84-21068# Centre de Recherches du Service de Sante des Armees, Lyons (France).

VARIATIONS IN STATES OF ALERTNESS DURING CONTINUOUS OPERATIONS AT THE CONTROL POST LEVEL [VARIATIONS DES ETATS DE VIGILANCE AU COURS D'OPERATIONS CONTINUES AU NIVEAU D'UN POSTE DE COMMANDEMENT] **c53**

J. Fourcade, A. Buguet (Niamey Univ.), R. Bugat (Centre d'Etudes et de Recherches Biophysiologiques Appliques a la Marine), and C. Raphel *In* AGARD Sustained Intensive Air Operations Nov. 1983 16p refs In FRENCH (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

The evolution of certain mental and decision making capacities of control post personnel was observed and two officers were chosen as representative of the group for neurophysiological studies of sleep and wakefulness as well as psychological and psychoergonomic evaluation. Urinalyses were also performed. Hypnograms from the neurophysiology of sleep tests show a difference in sleep deprivation for the two subjects because of the hours worked and the degree of comfort during sleep. Occipital and temporal deprivation obtained by EEG is plotted and results of the urinalysis are discussed. It is concluded that persons responsible for cognitive and decision making tasks at a control post must have a nearly normal amount of sleep.

Transl. by A.R.H.

N84-21069# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).

THE EFFECTS OF SLEEP LOSS AND SUSTAINED MENTAL WORK: IMPLICATIONS FOR COMMAND AND CONTROL PERFORMANCE **c53**

Robert G. Angus and Ronald J. Heslegrave *In* AGARD Sustained Intensive Air Operations Nov. 1983 21p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

During sustained military operations was investigated. Subjects were required to perform continuous cognitive work in an environment modelled after a command post during sustained battle. They assumed the role of operations duty officers and were required to handle message traffic during a 54-hour period of wakefulness. Performance was evaluated by monitoring the subjects' message-processing ability and by other objective tests embedded in and interspersed around the messages. Data are presented to show that sleep loss and sustained mental work can have dramatic effects on cognitive functions, even during the first night to sleep loss. The data also revealed that under this continuous cognitive workload, performance systematically declined. After 18 hours, performance declined substantially and remained at this lower lever for approximately another 24 hours. Performance then declined again to a level that would generally be viewed as unacceptable.

Author

N84-21070# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

ADAPTATION TO IRREGULARITY OF REST AND ACTIVITY **c53**

A. N. Nicholson, Barbara M. Stone, R. G. Borland, and M. B. Spencer *In* AGARD Sustained Intensive Air Operations Nov. 1983 6p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

The adaptation to conventional shiftwork is discussed in reference to circadian rhythmicity, quality of sleep, and general effectiveness of the individual during air operations. Observations of sleep parameters, physiochemical tests, and performance results provided evidence that during a lengthy period of irregular sleep and work, efficiency impairment increases. Circadian rhythmicity, the length of time on a task and cumulative sleep loss contributed to the impaired ability of the individuals. The most adverse effects were minimized by avoiding prolonged periods of work extending to the latter part of the night and by avoiding sleep loss. M.A.C.

N84-21071# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

SOME ISSUES IN RESEARCH ON EFFECTS OF SUSTAINED WORK AND SLEEP LOSS ON PERFORMANCE **c53**

A. F. Sanders *In* AGARD Sustained Intensive Air Operations Nov. 1983 8p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

The effects of sustained operations, sleep loss and diurnal rhythms in relation to human performance demands was examined. Performance impairment, sleep loss, alertness, motivation, reaction time, and task duration were used to establish performance guidelines. Short term tests suggested that directly interpreting input and handling output was impaired after sleep loss. The effects on performance of actual time-at-work are minor as compared to those of sleep loss and disturbance of diurnal rhythms. M.A.C.

N84-21072# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

HYPNOTICS AND AIR OPERATIONS

Anthony N. Nicholson *In* AGARD Sustained Intensive Air Operations Nov. 1983 8p refs (For primary document see N84-21062 11-52)

Avail: NTIS HC A10/MF A01

The selection and use of hypnotics for personnel involved in air operations is discussed. Diazepam (5 to 10 mg) is an excellent hypnotic when used occasionally for both night time and day time sleep, but it should not be ingested more than once every 48 hours and more than twice in 7 days. Temazepam and oxadepam are also useful, but oxazepam (15 to 30 mg) is unlikely to shorten sleep onset. Triazolam (0.125 to 0.25 mg) can be used daily - if this is essential - and this is so with the other triazolodiazepine, brotizolam (0.25 to 0.25 mg). Midazolam (10 to 20 mg) with its very short short elimination half-life is a promising hypnotic in the context of shiftwork. If hypnotics are to be used in the mangement of sleep difficulties in those who carry out skilled work a drug with which the individual is familiar must be used. It should be given at the lowest dose, and as infrequently as possible. There should be an interval of 24 h between ingestion and commencement of duty their use is supervised. Under these circumstances the interval may be reduced to 12 hours. M.A.C.

N84-21073# Centre de Recherches du Service de Sante des Armees, Lyons (France).

PSYCHO-ERGONOMIC PROBLEMS PRESENTED BY THE PROLONGED WEARING OF GAS MASKS [PROBLEMES PSYCHO-ERGONOMIQUES POSES PAR LE PORT PROLONGE DE MASQUES A GAZ]

J. Fourcade and C. Raphel *In* AGARD Sustained Intensive Air Operations Nov. 1983 13p refs In FRENCH (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

The adaptation of man to the gas mask and the constraints that wearing this protective device continuously from 16 to 48 hours imposes on his living and working were investigated in 34 subjects over a two year period without simulating a toxic chemical environment. The relation of the mask wearer with his environment, with other mask wearers, with the mask itself, and with nourishment were investigated. Results discussed cover the effects of the mask on visual tasks, sensorimotor adjustment (writing, walking, driving, use of instruments, etc.), verbal communication, and the making of medical examinations. The opinions of the subjects on their affective and mental states are examined including individual dynamics, sociability, the tendency for isolation, annoyance with the mask during work, manifestations of pain, sleeping conditions, and general comfort. Liquid feeding, caloric intake, and gastric system disturbances are also covered. A.R.H.

N84-21074# Army Aeromedical Research Lab., Fort Rucker, Ala. Biomedical Applications Research Lab.

SELECTED FACTORS AFFECTING AIRCREW PERFORMANCE DURING SUSTAINED OPERATIONS c53

Kent A. Kimball *In* AGARD Sustained Intensive Air Operations Nov. 1983 17p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

Six graduates of initial rotary wing training flew a UH-1H helicopter for up to 4 hours while wearing each of clothing ensembles. Each aviator wore the standard flight suit, the US chemical defense (CD) ensemble, and the United Kingdom (UK) CD ensemble in hot weather (mean WBCT 29 C). Skin temperatures (chest, thigh, upper arm, and calf), rectal temperature, heart rate, and preflight and postflight body weights were recorded. Cognitive testing was conducted preflight, postflight, and on nonflight days. Aviator performance measures were also obtained during flight. Well acclimatized aviators were able to fly at least 2 hours without serious physiological impairment. Three of the six aviators terminated flight for medical reasons (heart rates $>$ 40 bpm or nausea) while wearing the US ensemble. The susceptible subjects tended to be older and heavier. Heart rate was judged to be the most sensitive indicator of heart stress. Cognitive testing and flight performance data obtained during this exercise did not demonstrate changes as a function of the type of flight ensemble worn during the test, nor did flight performance serve as a predictor of heart stress. Author

N84-21075# School of Aerospace Medicine, Brooks AFB, Tex. Crew Technology Div.

AIRCREW FATIGUE DURING EXTENDED TRANSPORT, TACTICAL, AND COMMAND POST OPERATIONS

William F. Storm *In* AGARD Sustained Intensive Air Operations Nov. 1983 16p (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

Self ratings of subjective fatigue and sleep logs provide a simple and useful means of evaluating aircrew during real world operations involving large numbers of participants working irregular schedules. Evaluations of extended USAF operations involving transport, tactical, and airborne command post systems are reviewed. Following outboard crew rest on C-141 transport aircraft flying 8 to 9 hour missions, aircrew performance in simulator missions was significantly deteriorated and accompanied by reports of severe fatigue. Tactical aircrews are being trained and evaluated in unit flying at the fast pace expected in the first crucial days of an armed conflict. Flying 2 to 3 sorties a day for a week or more resulted in reports of only moderate fatigue. Daily fatigue was ameliorated by a night of quality sleep. During a 10 hour airborne command post mission, crew fatigue was moderate and not suggestive of compromises in performance. After mission completion, severe levels of fatigue were reported. Author

N84-21076# Bergen Univ. (Norway).

ATTENTION, PERFORMANCE, AND SUSTAINED ACTIVATION IN MILITARY AIR TRAFFIC CONTROLLERS c53

H. Ursin, S. Grahnstedt, I. Hansen, K. Myhre, P. K. Opstad, B. Walther, and H. Andersen (Inst. of Aviation Medicine) *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs Prepared in cooperation with the Norwegian Defense Research Establishment, Kjeller (Norway) (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

Trained military air traffic controllers report increased anxiety following, and demonstrate increased heart rate and urinary levels of epinephrine during a session of ground control interception. This type of activation has no detrimental effects on health, and is probably necessary for efficient performance even in well trained and coping personnel. There was also some rise in plasma levels of cortisol, but no other endocrine signs of any general activation. However, if the coping potential of the men is threatened, in a real life situation, the activation picture is expected to be totally different, with a general activation which is far more taxing both on the information treating capacity and on the brain biochemistry. Psychological defense mechanisms will then be activated, which also impede performance. These psychological and physiological mechanisms are difficult to mimic, and occur only when the individual feels a real danger and threat to his or her coping potential. Author

N84-21077# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).

SUSTAINED PHYSICAL ACTIVITY IN DIVERSE SITUATIONS: METABOLIC AND HORMONE DATA [L'AVTIVITE PHYSIQUE SOUTENUE DANS DIVERSES SITUATIONS DONNEES METABOLIQUES ET HORMONALES]

P. C. Pesquies and C. Y. Guezennec *In* AGARD Sustained Intensive Air Operations Nov. 1983 8p refs In FRENCH (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

Physical activity undergone or repeated during more than three hours, at a level corresponding to more than 50% of VO2 maximum, involves a hormonal table characterized by an elevation of cortisol and a lowering of testicular androgens. The intimate mechanisms which led to this hormonal table, characterized by an antagonism between the catabolic and anabolic hormones as well as the consequences of the metabolism is demonstrated in studies of white Wistar rats. The regulation of metabolism during environmental constraints encountered by military personnel is discussed with emphasis on physical exercises, exposure to cold, and deprivation of food. A.R.H.

N84-21078# Centre d'Essais en Vol, Bretigny-Air (France). Lab. de Medecine Aerospatiale.
THERMAL CONSTRAINTS IN A HELICOPTER DURING LONG DURATION FLIGHTS UNDER EXTREME CLIMATIC CONDITIONS [CONTRAINTES THERMIQUES EN HELICOPTERE AU COURS DES VOLS DE LONGUE DUREE EN AMBIANCES CLIMATIQUES EXTREMES]
C. Boutelier, E. Maurice, C. Lefievre, and G. Guerin *In* AGARD Sustained Intensive Air Operations Nov. 1983 7p refs In FRENCH (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

The physiological and psychophysiological effects of extreme climatic conditions on helicopter crews were observed and analyzed. It is concluded that the operational efficiency of flight crews can be obtained by adopting four measures: (1) preliminary acclimatization of the crews; (2) limitation of hours of flight with a possibility for rest between flights in a climatized environment; (3) improvement of the comfort and ergonomics of the pilot station; and (4) improvement of equipment and a partial or total individual acclimatization. A.R.H.

N84-21079# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
WORKLOAD OF PERSONNEL ENGAGED IN AIR DEFENCE **c54**
R. G. Borland and Alison S. Rogers *In* AGARD Sustained Intensive Air Operations Nov. 1983 6p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

Workload is defined in many ways and the methods employed to quantify workload are a legion. Jahns (1972) suggested the subject should be divided into the three broad areas of input load, operator effort and work result, while Hartman (1961) has defined input load as the sum of all requirements imposed on an operator at any instant by the system. In the past it was common practice to limit the system to the local environment or crew station and to consider the engineerings, physiological and psychological factors affecting the operator, and little attention was given to studying the workload imposed by the daily pattern of work and rest, for as Selye (1974) points out, stress is a reasonably normal component in every day life and can be adaptive, but cumulative stress becomes maladaptive and ultimately then stress becomes distress. The three studies reported were designed to establish the normal pattern of work and rest of selected personnel from operational units engaged in air defense and to identify possible areas of high workload or stress. R.J.F.

N84-21080# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
HUMAN FACTORS OF AIR OPERATIONS IN THE SOUTH ATLANTIC CAMPAIGN **c54**
J. A. Baird (Royal Air Force Strike Command) and A. N. Nicholson *In* AGARD Sustained Intensive Air Operations Nov. 1983 4p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

The role of human factors engineering in the management of the invasion of the Falkland Islands by the United Kingdom in April 1982 is discussed. Sorties of very long duration and intensive rates of work were two particular problems that were studied. During the South Atlantic Campaign advice on human factors proved of great significance in determining the frequency of sorties and the number of sorties flown by each crew. Flight Supervisors were given clear directives about crew scheduling and flight medical officers monitored all aircrew. The aircrew on Ascension Island were given priority for accommodation to ensure good rest facilities and their feeding was closely supervised. Hypnotics were extensively used for the first time with very beneficial results. A total of some 1,000 RAF aircrew were involved in Operation Corporate and morale and motivation remained at a very high level throughout the campaign. R.J.F.

N84-21081# Institut fuer Wehrmedizin und Hygiene, Koblenz (West Germany). Physiology and Ergonomics Div.
SUSTAINED MILITARY OPERATIONS WITH PARTICULAR REFERENCE TO PROLONGED EXERCISE
G. Kleinhanss and G. Schaad *In* AGARD Sustained Intensive Air Operations Nov. 1983 8p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

The effects of sleep deprivation and intense work are studied in the context of military operations. Motivation was found to be an important factor in task performance. R.J.F.

N84-21082# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
NON-INVASIVE METHODS OF CARDIOVASCULAR EXPLORATION IN AEROSPACE MEDICINE
R. Carre (Centre Principal d'Expertise Medicale du Personnel Navigant de l'Aeronautique), R. Amoretti, A. Coignard, J. Colin, A. Didier, J. Droniou, J. F. Gaillard, Ch. Hiltenbrand, H. Ille, Ph. Lantrade et al Loughton, England Dec. 1983 213 p refs (AGARD-AG-277(E); ISBN-92-835-1464-5) Avail: NTIS HC A10/MF A01

Noninvasive methods of cardiography used in determining flight fitness for flight personnel were examined. These methods include standard electrocardiogram and cardiac radiography analysis of heart abnormalities, continuous electrocardiograph monitoring, study of ventricular pre-excitations syndromes, X ray fluorescence of the cardiovascular system, and information on the exercise electrocardiogram. The merits of each technique as it applies to aerospace medicine in general and flight crew fitness in particular is discussed. For individual titles, see N84-21083 through N84-21097.

N84-21083# Centre Principal d'Expertises Medicales du Personnel Navigant de l'Aeronautique, Paris (France).
MAIN ELECTROCARDIOGRAPHIC ABNORMALITIES IN THE MEDICAL EXAMINATION OF FLYING PERSONNEL
R. Carre, A. Didier, and H. Ille *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 1-12 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The electrocardiographic tests that qualify flight personnel for duty on very high performance aircraft were examined. Tests included electro-cardiographic recordings for certain arrhythmias, right and left bundle blockage or deviation, Wolff-Parkinson-White syndrome, atypical ventricular repolarization, and sequella of myocardial infarctus. The significance of each disorders as it applies to flight personnel was discussed. M.A.C.

N84-21084# Hopital d'Instruction des Armees, Paris (France).
VENTRICULAR PRE-EXCITATION SYNDROMES
J. Droniou *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 13-24 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

Ventricular Pre-Excitation (VPE) syndrome in flight personnel was discussed. Current understanding of the disorder as well as diagnosis, prognosis, classification, and mechanisms of the disease as it applies to flight personnel was presented. Electro cardiographs detailing characteristic tachyarrhythmias of the syndrome were included. M.A.C.

N84-21085# Hopital d'Instruction des Armees, Versailles (France).
THE EXERCISE ELECTROCARDIOGRAM
G. Leguay and A. Seigneuric *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 25-63 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The use of the exercise electrocardiogram (EECG) in the determination of physical fitness was thoroughly discussed. Factors effecting the results of the EECG such as maximum oxygen consumption, cardiac output and basic techniques of EECG use were presented. A comparison between a normal EECG and that of a graph showing coronary failure was included. The EECG must be interpreted by taking into account the intensity of exertion,

nature of the ST shift, HRxBP product, age, sex, and risk factor such as smoking or hypertension. In an asymptomatic population such as military personnel, the EECG cannot be used as a reliable means of mass screening for coronary failure. M.A.C.

N84-21086# Hopital d'Instruction des Armees, Versailles (France).
CONTINUOUS ECG MONITORING BY THE HOLTER METHOD
G. Leguay and A. Seigneuric *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 65-81 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The Holter method of continuous electrocardiograph (ECG) recording in the active subject was discussed with primary focus on heart arrhythmias and repolarization disorders. The technical aspects of the recorder, lector, and computer were examined. The method aids in the indication of antiarrhythmic medication efficiency, including the speed and duration of drug action. Continuous ECG recording allows close monitoring of coronary artery disease treatment and patients with heart pace makers. M.A.C.

N84-21087# Hopital d'Instruction des Armees, Versailles (France).
THE HOLTER METHOD IN AERONAUTICAL MEDICINE
G. Leguay and A. Seigneuric *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 83-86 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The Holter method was discussed as a means of monitoring pilot and flight crew cardiac performance during all the operations of different mission types. Emphasis was placed on fighter pilots subject to extreme accelerations and transport aircraft crews effected by circadian rhythm disruption. The Holter method could provide information on inflight malaises, cardiac tolerance, and flight adaptation that would contribute to air safety. M.A.C.

N84-21088# Centre Principal d'Expertises Medicales du Personnel Navigant de l'Aeronautique, Paris (France).
CONTRIBUTION OF STANDARD X-RAY TO CARDIOVASCULAR EXPLORATION DURING THE CLINICAL EXAMINATION OF FLYING PERSONNEL
M. Puech and P. J. Metges (Hopital d'Instruction des Armees, Saint Mande, France) *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 87-92 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The use of teleradiography and televised fluoroscopy in the cardiovascular examinations of flight personnel was discussed. Heart fluoroscopy allows analysis of the shape and dynamic features of the heart cavities, aorta, and the pulmonary arteries. Normal heart anatomy and physiology was described and compared with minor abnormalities found in flight crews. Four position teleroentgenography and televised fluoroscopy remain the usual methods for the analysis and kinetic investigation of the cardiovascular silhouette and pulmonary vascularisation and are now also part of the battery of tests used to assess flight fitness. M.A.C.

N84-21089# Centre Principal d'Expertises Medicales du Personnel Navigant de l'Aeronautique, Paris (France).
CONTRIBUTION OF CARDIAC MECHANOGRAMS IN THE EXPERT EXAMINATION OF FLYING PERSONNEL
R. Carre, R. Amoretti, A. Didier, and H. Ille *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 93-112 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

Non-invasive cardiac mechanograms are easily reproducible at each examination and provide recordings which can be added to the pilot's medical record and compared from one examination to another. Cardiac mechanograms provide three types of information: (1) analysis of cardiac murmurs, determining the type of heart disease on the basis of phonocardiography; (2) study of arterial distension from the carotid pulse cardiogram; and (3) chronocardiographic determinations based on the systolic time intervals which give some idea of the contraction of the myocardial muscle. Techniques for the analysis of various murmurs, aortic stenosis, mitral defect, pulmonary stenosis, and aortic coarctation are described. M.G.

N84-21090# Hopital d'Instruction des Armees, Paris (France).
ECHOCARDIOGRAPHY IN THE EXPERT EXAMINATION OF FLYING PERSONNEL
J. Droniou and A. Coignard *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 113-142 (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The technical principles of echocardiography are reviewed and the various types and imaging capabilities are described. The use of echocardiography in the detection and analysis of pathological heart conditions is discussed. Finally, the practical modalities of the application of echocardiography to the expert examination of flying personnel are considered. M.G.

N84-21091# Centre Principal d'Expertises Medicales du Personnel Navigant de l'Aeronautique, Paris (France).
EXPLORATION OF ARTERIAL FUNCTION USING DOPPLER FLOW DETERMINATION. APPLICATION TO AERONAUTICAL AND SPACE MEDICINE
A. Didier, H. Ille, C. Ribadeau-Dumas, Ph. Lantrade, and Ch. Hiltenbrand *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 143-156 refs Prepared in cooperation with Hopital d'Instruction des Armees, Paris (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The instrumentation and capabilities of continuous and pulse emission arterial dopplerography are discussed. The Doppler ultrasonic determination of the blood flow rate makes use of the Doppler-Fizeau principle by determining the change of frequency of an ultrasonic beam directed onto the vessel under study. The beam is reflected by solid elements within the blood, the flow rate of which is the same as that of the bloodstream as a whole. The change of frequency is a function of the blood flow but also of the angle (theta) of incidence at which the ultrasonic beam strikes the vessel. The data obtained is in the form of a velocity and its exact determination depends on knowing the angle theta. Calculation of the blood flow rate depends on determination of the cross-section of the vessel. The accuracy of the data obtained and the total lack of risk of the method suggests that it should have a place in aeronautical and space medicine, in the medical examination of flying personnel and the investigation of physiological changes of arterial flow in the body during aeronautical and space pressures. M.G.

N84-21092# Hopital d'Instruction des Armees, Paris (France).
THE CONTRIBUTION OF NUCLEAR MEDICINE TO CARDIOLOGY
J. F. Gaillard *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 157-164 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

Isotopic methods of exploration have developed greatly over the last twenty years and now constitute important complementary cardiological examinations. In 1948 PRINZMETAL introduced the radiocardiogram by external detection recording of the dilution curve of a radioactive indicator in the cardiac cavities. In 1964 CARR introduced static scintigraphy, followed by a link-up of the gamma camera to a computer which from the 1970's made possible the development of rapid dynamic investigations and computer-processing of the image obtained. Recently gamma or positron emission tomography has provided results in detailed studies of the vascularization and metabolism of the myocardium. Isotopic methods provide information which was generally not available previously except by means of invasive radiological explorations using contrast media and recently by ultra-sound. The non-invasive functional investigation of an organ is the main contribution of nuclear medicine. The possibility of quantifying organ function, of describing it by means of graphs, diagrams and image remains

unrivalled. The contribution of nuclear medicine to the examining expert is important because of the non-invasive nature of most of the methods. Author

N84-21093# Rome Univ. (Italy). School of Aerospace Medicine.
HALLISTOCARDIOGRAPHY: A NON-INVASIVE METHOD ADVANCING TOWARDS CLINICAL APPLICATION
Aristide Scano *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 165-170 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The evolution of ballistocardiographic (BCG) methods is reviewed. Ballistocardiography can be defined as a non-invasive method of recording and studying periodic accelerations of the body mass due to the inertia reaction it presents at every ventricular systole. The typical sequence of waves which constitutes the BCG tracing differs quantitatively according to the bodily axis (the ones recorded along the longitudinal axis are generally more ample), according to the state of rest or physical exercise, the age and pathological conditions of the heart and/or the large arterial vessels. Specific applications are discussed. M.G.

N84-21094# Centre de Recherches du Service de Sante des Armees, Clamart (France).
USE OF CHANGES IN ELECTRICAL IMPEDANCE IN CARDIOLOGY
J. Colin *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 171-179 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The investigation of variations of electrical impedance is of particular value amongst the non-invasive methods used in physiological and clinical study of heart function because of the absence of risk, ease of the procedure and the possibility of repeating determinations or carrying out continuous determinations over long periods. The physical bases of the method of determining electrical impedance are reviewed along with the required instrumentation. The analytic capabilities of thoracic, aortic, and cardiac plethysmography are discussed. M.G.

N84-21095# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).
VALUE OF THE TILT TABLE IN THE EXPLORATION OF CIRCULATORY FUNCTION
J. Timbal *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 183-187 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

Any change of position from the inclined to the upright position or vice versa results in important hemodynamic changes which result mainly from the rapid transfer of part of the total blood from one territory to another. The value of this type of maneuver in exploring circulatory system functions is discussed. The tilt table makes it possible to standardize observation conditions and to eliminate any muscular effect. If properly carried out, the method provides a passive orthostatic or antiorthostatic test. In practice, it is the orthostatic tests which are most commonly used in both functional exploration during the selection or medical check up of aeronautical teams and for more fundamental research. Antiorthostatic tests have been used particularly in the Soviet Union for the selection of cosmonauts. The short term effects of passage from the horizontal to the vertical position are considered. M.G.

N84-21096# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
VALUE OF THE LOWER BODY NEGATIVE PRESSURE TEST IN AEROSPACE MEDICINE
B. Vettes and H. Viellefond *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 189-192 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The lower body negative pressure (LBNP) test is of two-fold interest in aerospace medicine. First, it provides an excellent method for investigation of the cardiovascular and respiratory changes associated with weightlessness and secondly it provides a method of preventing these problems during flight. The daily use of the LBNP during a period of one month of total bedrest is very effective in preventing the loss of plasma, reducing the increase in heart rate and maintaining the cardiac index at a more satisfactory level during the LBNP. It is therefore not surprising that use of the LBNP has been extended to the training of astronauts and to the prevention of the severe orthostatic syndromes which occur after a return from a mission. However, aeronautical medicine can also benefit from the lower body negative pressure test not only as a clinical orthostatic test but especially as a means of investigating cardiovascular adaptation capacity to the positive longitudinal accelerations known as + Gz. The physiopathological disturbance produced by + Gz accelerations are of vascular origin and the mechanism by which they occur is fairly similar to that underlying LBNP. M.G.

N84-21097# Laboratoire de Medecine Aerospatiale, Bretigny-sur-Orge (France).
METHODS AND MAJOR FINDINGS OF CARDIOVASCULAR EXPLORATION INVOLVING THE HUMAN CENTRIFUGE
B. Vettes and H. Vieillefond *In* AGARD Non-Invasive Methods of Cardiovascular Exploration in Aerospace Med. Dec. 1983 p 193-201 refs (For primary document see N84-21082 11-52)
Avail: NTIS HC A10/MF A01

The cardiovascular effects of accelerations as produced by human centrifuge experiments are discussed. Particular attention is given the evasive and non-evasive techniques used to monitor heart rate, arterial pressure, venous pressure, cardiac output, and local blood flow. The use of visual field criteria as a way of assessing hemodynamic tolerance is also addressed. M.G.

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N84-21098# Human Resources Research Organization, Alexandria, Va.
MEMORY ORGANIZATION-BASED METHODS OF INSTRUCTION: A COMPARISON WITH PERFORMANCE-ORIENTED TRAINING Final Report, Feb. - Oct. 1983
R. G. Hoffman, E. H. Drucker, J. E. Morrison, and S. L. Goldberg Jan. 1984 54 p
(Contract MDA903-80-C-0223; DA Proj. 2Q2-63743-A-794)
(AD-A137640; HUMRRO-FR-TRD(KY)-83-6; ARI-RN-84-26) Avail: NTIS HC A04/MF A01 CSCL 05/10

Based on an overview of principles of cognitive, information processing psychology concerning the structuring of information in memory, training was designed to give students task organizing information to aid their recall of four armor crewman tasks. Two alternative strategies for presenting the structure were developed: one in which the task structure information guided the presentation from the beginning of training, and one in which students were first allowed to have hands-on exposure to the task before being given the structure information. Under the constraint that these alternative training programs should not cost extra training time, they did not improve learning over the Army's standard performance oriented training strategy. Discussion concerned the role of practice and student ability in the acquisition of memory organization during learning. GRA

N84-21099# Georgia Inst. of Tech., Atlanta.
BINARY CLASSIFICATION AND THE SUBTRACTIVE APPROACH
Gregory M. Corso, Suzanne Kelly (AF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio), and Danny E. Bridges (AF Aerospace Medical Research Lab., Wright-Patterson AFB, Ohio)

Sep. 1983 32 p
(Contract F49620-82-C-0035; AF Proj. 7184)
(AD-A137716; AFAMRL-TR-83-050) Avail: NTIS HC A03/MF A01 CSCL 05/10

Two experiments were performed using a modification of the subtractive approach to the partitioning of human reaction time. This investigation provided information concerning the effects of display size, classification rules, and interference stimuli on input and output latencies. The major findings from this investigation showed that input and output latencies were affected by different independent variables and provided information regarding the cognitive processes within a binary classification task not observed with previous methods. Suggestions for further research are presented. GRA

N84-21100# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
THE EVENT RELATED BRAIN POTENTIAL AS AN INDEX OF INFORMATION PROCESSING, COGNITIVE ACTIVITY, AND SKILL ACQUISITION: A PROGRAM OF BASIC RESEARCH Final Progress Report, 1 Sep. 1979 - 31 Aug. 1983
Emmanuel Donchin, Christopher Wickens, and Michael G. H. Coles Oct. 1983 189 p
(Contract F49620-79-C-0233; AF Proj. 2313)
(AD-A137779; CPL83-4; AFOSR-84-0051TR) Avail: NTIS HC A09/MF A01 CSCL 05/10

The materials assembled in this report represent work conducted with AFOSR support at the Cognitive Psychophysiology Laboratory during the reporting period. Appendix A of the report contains abstracts and papers that have been presented at various scientific meetings. In the text we present a brief review of these studies. For studies not included in Appendix A, a longer review is given. Appendix B gives a list of items that are either final versions of materials that were presented in previous progress reports or review chapters. GRA

N84-21101# Human Resources Research Organization, Alexandria, Va.
MEMORY ORGANIZATION-BASED METHODS OF INSTRUCTION: RATIONALE AND DEVELOPMENT Interim Report, Feb. - Aug. 1983
R. G. Hoffman and John E. Morrison Jan. 1984 230 p
(Contract MDA903-80-C-0223; DA Proj. 2Q2-63743-A-794)
(AD-A137504; ARI-RN-84-25) Avail: NTIS HC A11/MF A01 CSCL 05/10

An effort was made to improve training techniques in order to increase retention of procedural tasks common to armor crewmen. Based on an overview of principles of cognitive, information processing psychology concerning the structuring of information in memory and on research using various memory organization mnemonics, a general training strategy was described. The strategy began with a systematic structure analysis of tasks to be trained. Training was then designed to give students the organizing structure to aid their recall of the task. Two alternative strategies for presenting the structure were developed: one in which the structure guided the presentation from the beginning of training, and one in which students were first allowed to have hands-on exposure to the task before being given the structure information. Training programs using these two training strategies, along with programs using the Army's standard performance-oriented training strategy were developed for four tasks performed by M1 (Abrams) tank crew members. GRA

N84-21063# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
CONCEPTUAL FRAMEWORK FOR THE DEVELOPMENT OF WORKLOAD METRICS IN SUSTAINED OPERATIONS
Robert D. ODonnell (Wright State Univ.) and F. Thomas Eggemeier (Systems Research Labs., Inc.) *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21064# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Workload and Ergonomics Branch.
THE U.S. AIR FORCE NEUROPHYSIOLOGICAL WORKLOAD TEST BATTERY: CONCEPT AND VALIDATION
Robert D. ODonnell *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21065# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Workload and Ergonomics Branch.
BEHAVIORAL AND SUBJECTIVE WORKLOAD METRICS FOR OPERATIONAL ENVIRONMENTS
Clark A. Shingledecker *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21068# Centre de Recherches du Service de Sante des Armees, Lyons (France).
VARIATIONS IN STATES OF ALERTNESS DURING CONTINUOUS OPERATIONS AT THE CONTROL POST LEVEL [VARIATIONS DES ETATS DE VIGILANCE AU COURS D'OPERATIONS CONTINUES AU NIVEAU D'UN POSTE DE COMMANDEMENT]
J. Fourcade, A. Buguet (Niamey Univ.), R. Bugat (Centre d'Etudes et de Recherches Biophysiologiques Appliques a la Marine), and C. Raphel *In* AGARD Sustained Intensive Air Operations Nov. 1983 16p refs In FRENCH (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21069# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THE EFFECTS OF SLEEP LOSS AND SUSTAINED MENTAL WORK: IMPLICATIONS FOR COMMAND AND CONTROL PERFORMANCE
Robert G. Angus and Ronald J. Heslegrave *In* AGARD Sustained Intensive Air Operations Nov. 1983 21p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21070# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
ADAPTATION TO IRREGULARITY OF REST AND ACTIVITY
A. N. Nicholson, Barbara M. Stone, R. G. Borland, and M. B. Spencer *In* AGARD Sustained Intensive Air Operations Nov. 1983 6p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21071# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
SOME ISSUES IN RESEARCH ON EFFECTS OF SUSTAINED WORK AND SLEEP LOSS ON PERFORMANCE
A. F. Sanders *In* AGARD Sustained Intensive Air Operations Nov. 1983 8p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21074# Army Aeromedical Research Lab., Fort Rucker, Ala. Biomedical Applications Research Lab.
SELECTED FACTORS AFFECTING AIRCREW PERFORMANCE DURING SUSTAINED OPERATIONS
Kent A. Kimball *In* AGARD Sustained Intensive Air Operations Nov. 1983 17p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21076# Bergen Univ. (Norway).
ATTENTION, PERFORMANCE, AND SUSTAINED ACTIVATION IN MILITARY AIR TRAFFIC CONTROLLERS
H. Ursin, S. Grahnstedt, I. Hansen, K. Myhre, P. K. Opstad, B. Walther, and H. Andersen (Inst. of Aviation Medicine) *In* AGARD Sustained Intensive Air Operations Nov. 1983 10p refs Prepared in cooperation with the Norwegian Defense Research Establishment, Kjeller (Norway) (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N84-21102 Texas A&M Univ., College Station.
MODELING AND ROBUST CONTROL OF A COMPLIANT ROBOTIC MANIPULATOR VIA THE FINITE ELEMENT METHOD Ph.D. Thesis
Louis Jackson Everett 1983 200 p
Avail: Univ. Microfilms Order No. DA8329919

Robotic manipulators are often used in a production environment to help increase productivity, and product quality. It is therefore desirable to operate the manipulator accurately and at high speed. Unfortunately, structural compliance (when ignored in the control system) limits the speed at which the manipulator can be given. It has been shown elsewhere, that this speed limitation is removed when the compliance is accommodated in the control design. It has also been shown, however, that these compliant manipulator control systems (when based upon pole placement algorithms) are sensitive to slight variations in payload and manipulator configuration. The sensitivity is so severe that, even under idealized assumptions, the system often loses stability. This research attacks the problem of designing an insensitive control system for a compliant manipulator. The servo control utilized is a simple extension of the well known Linear Quadratic Regulator which is known to possess excellent sensitivity properties.
Dissert. Abstr.

N84-21103# Hughes Aircraft Co., El Segundo, Calif. Display Systems Lab.
EVALUATION OF ARMY REMOTELY PILOTED VEHICLE MISSION PAYLOAD OPERATOR PERFORMANCE IN SIMULATED ARTILLERY MISSIONS Final Technical Report, Apr. 1981 - Sep. 1983
M. L. Hershberger, S. A. Murray, P. FitzHenry, and A. J. Farnochi Nov. 1983 67 p
(Contract DAAK20-81-C-0133)
(AD-A137602; HAC-P30759; HAC-E9224; DELCS-TR-81-0133-F)
Avail: NTIS HC A04/MF A01 CSCL 05/8

A real-time operator-in-the-loop simulation of the Army Remotely Piloted Vehicle mission payload operations was developed and conducted. This report describes the RPV system and its mission, the operation of the mission payload system, the implementation of the simulation, and the results and their implications to design and operation of the mission payload system.
Author (GRA)

N84-21104# Human Engineering Labs., Aberdeen Proving Ground, Md.
HUMAN ENGINEERING GUIDELINES FOR MANAGEMENT INFORMATION SYSTEMS. CHANGE 1
D. E. Hendricks, P. W. Kilduff, P. Brooks, R. Marshak, and B. Doyle 9 Jun. 1983 164 p
(AD-A137808; AD-E900298) Avail: NTIS HC A08/MF A01 CSCL 05/5

These guidelines are intended to be an aid for the inclusion of human factors considerations in the design of Management Information Systems (MIS). The US Army Material Development and Readiness Command (DARCOM) is faced with a problem of continuing growth in workload combined with constrained or decreasing numbers of personnel. Like many other corporate entities, DARCOM has decided to accelerate the growth of computer utilization in order to increase the productivity of the workforce. In addition to increased computer utilization, there is emphasis toward distributive processing. Distributive processing places computer power in the hands of the functional used which allows the user to interact with (manipulate) the data. Unfortunately, empirical evidence indicates that expenditures on computers are not accompanied, necessarily, by the expected rises in productivity. The paper resulting from this research from this research presented selected personnel data relevant to the design of computer systems and problems of human-computer interaction divided into eight areas: the system design process, system downtime, training, input, data manipulation or retrieval, output, the work station, and communication. (Hendricks, D.E., Man/Computer Interaction in DARCOM. A paper presented at the 1980 AMEDD Psychology Symposium at Walter Reed Army Medical Center, Washington, DC, October, 1980.) Appendix A contains a list of three problems. With an overview of systems and user characteristics, the research team combined that information with the results of an extensive literature search to develop these guidelines for inclusion of human factors considerations during system development or system improvement.
GRA

N84-20719# L'Air Liquide, Sassenage (France). Food and Pharmaceutical Industries Dept.
FOOD PRESERVATION WITH GAS
M. Coulon *In* South African Inst. of Refrigeration and Air Conditioning Frigair 1983: Papers 1983 12 p (For primary document see N84-20717 11-31)
Avail: NTIS HC A14/MF A01

N84-21066# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio. Human Engineering Div.
LABORATORY STUDIES OF AIRCREW CHEMICAL PROTECTIVE ENSEMBLE: EFFECTS ON PILOTS' PERFORMANCE
Grant R. McMillan, William J. Cody (McDonnell-Douglas Astronautics Co.), and Robert G. Mills *In* AGARD Sustained Intensive Air Operations Nov. 1983 18p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21079# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
WORKLOAD OF PERSONNEL ENGAGED IN AIR DEFENCE
R. G. Borland and Alison S. Rogers *In* AGARD Sustained Intensive Air Operations Nov. 1983 6p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

N84-21080# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).
HUMAN FACTORS OF AIR OPERATIONS IN THE SOUTH ATLANTIC CAMPAIGN
J. A. Baird (Royal Air Force Strike Command) and A. N. Nicholson *In* AGARD Sustained Intensive Air Operations Nov. 1983 4p refs (For primary document see N84-21062 11-52)
Avail: NTIS HC A10/MF A01

55 PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering.*

N84-21105# General Dynamics Corp., Fort Worth, Tex. Data Systems Div.

DISTRIBUTED PROCESSING TOOLS DEFINITION. VOLUME 1: HARDWARE AND SOFTWARE TECHNOLOGIES FOR TIGHTLY-COUPLED DISTRIBUTED SYSTEMS Final Technical Report, Jun. 1981 - Jan. 1983

Herbert C. Conn, Jr., David L. Kellogg, and David J. Rodjak Griffiss AFB, N.Y. RADC Jun. 1983 205 p 3 Vol.

(Contract F30602-81-C-0142; AF Proj. 5581)

(AD-A137686; RADC-TR-83-107-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 09/2

The objective of this three-phase effort is to Identify the hardware/software technology pertinent to the implementation of tightly-coupled embedded distributed systems for DoD applications, establish an integrated approach regarding the total life-cycle software development period with correlation as to the applicability of existing/near-term software engineering methodology, techniques and tools to each life-cycle phase, and define the functional design requirments pertinent to the far-term development of needed software engineering methodology, techniques and tools. A product of this effort is the recommended design of a system support environment encompassing the integrated implementation of candidate software engineering tools. GRA

N84-21106# General Dynamics Corp., Fort Worth, Tex. Data Systems Div.

DISTRIBUTED PROCESSING TOOLS DEFINITION. VOLUME 2: APPLICATION OF SOFTWARE ENGINEERING TECHNOLOGY Final Technical Report, Jun. 1981 - Jan. 1983

Herbert C. Conn, Jr., David L. Kellogg, Rodney M. Bond, Sates L. Nelson, Scott L. Harmon, Sue A. Johnson, William D. Baker, and Paul B. Dobbs Griffiss AFB, N.Y. RADC Jun. 1983 176 p 3 Vol.

(Contract F30602-81-C-0142; AF Proj. 5581)

(AD-A137687; RADC-TR-83-107-Vol-2) Avail: NTIS HC A09/MF A01 CSCL 09/2

Progress in the Distributed Processing Tools Definition Study is reported. The ojectives are to investigate the requirements for software life cycle support in embedded distributed processing systems and to specify applicable software tools and techniques by life cycle phase. M.G.

N84-21107# General Dynamics Corp., Fort Worth, Tex. Data Systems Div.

DISTRIBUTED PROCESSING TOOLS DEFINITION. VOLUME 3: AN INTEGRATED SOFTWARE ENGINEERING ENVIRONMENT FOR DISTRIBUTED PROCESSING SOFTWARE DEVELOPMENT Final Technical Report, Jun. 1981 - Jan. 1983

H. C. Conn, Jr., D. L. Kellogg, S. L. Nelson, S. L. Harmon, and S. A. Johnson Griffiss AFB, N.Y. RADC Jun. 1983 351 p

(Contract F30602-81-C-0142; AF Proj. 5581)

(AD-A137688; RADC-TR-83-107-Vol-3) Avail: NTIS HC A16/MF A01 CSCL 09/2

The objective of this three-phase effort is to identify the hardware/software technology pertinent to the implementation of tightly-coupled embedded distributed systems for DoD applications, establish an integrated approach regarding the total life-cycle software development period with correlation as to the applicability of existing/near-term software engineering methodology, techniques and tools to each life-cycle phase, and define the functional design requirements pertinent to the far-term development of needed software engineering methodology, techniques and tools. A product of this effort is the recommended design of a system support environment encompassing the integrated implementation of candidate software engineering tools. GRA

N84-21108# Army Construction Engineering Research Lab., Champaign, Ill.

THE MICROCOMPUTER KNOWLEDGE BASE: INTRODUCTION AND USER INSTRUCTIONS Final Report

F. Mabry, W. Hohensee, and G. Norris Jan. 1984 64 p

(AD-A137694; CERL-TR-P-155) Avail: NTIS HC A04/MF A01 CSCL 09/2

Access and user instructions are given for the Microcomputer Knowledge Base (MICROS), a vehicle for supplying general information about the applications of microcomputers in support of the Corps of Engineers Civil Works mission. MICROS is intended to foster interaction between Corps field personnel and experts in various areas of microcomputer applications. GRA

N84-21109# Sandia Labs., Albuquerque, N. Mex. Div. 3151.

ONE SOLUTION TO STAR-1100 IN A DUAL MACHINE ENVIRONMENT

Marie Grady 1983 9 p Presented at the USE Conf., Orlando, Fla., 4 Oct. 1983

(Contract DE-AC04-76DP-00789)

(DE83-017160; SAND-83-1874C; CONF-8310211-3) Avail: NTIS HC A02/MF A01

Modifications to STAR to allow a split machine environment included modification of the scratch and clean run to include two machines and a change to the EXEC portion of STAR to turn off some file name checking. The change was almost transparent to the user community with two one-page bulletins providing sufficient information and no runstream changes required. After initial training, the tape library is functioning smoothly. In spite of the physical proximity of the two machines, very little operator confusion has resulted. This solution to the dual machine problem appears quite satisfactory providing there is no overriding need to be able to write individual tapes on both machines at will. There does not seem to be any reason why this solution could not be expanded to an environment with more than two machines. DOE

N84-21110# Sandia Labs., Albuquerque, N. Mex. Data Systems Development Div.

SANDUS MA164 DIGITAL DATA ACQUISITION SYSTEM SPECIFICATIONS, NOVEMBER 8, 1982

James M. Opalka Nov. 1983 28 p

(Contract DE-AC04-76DP-00789)

(DE84-006502; SAND-83-2038) Avail: NTIS HC A03/MF A01

The MA164 will accept data from up to 128 analog channels. It is capable of simultaneously conditioning, amplifying, digitizing, and internally storing the data from all channels. The system records analog signals in the range of 1 mV to 1 V at frequencies from dc to 100 kHz accurately to 0.024% and/or signals in the range of 8 mV to 4 V at frequencies from dc to 10 MHz accurately to 0.3%. The digitized data are continually output to a remote location for processing and the entire system can be controlled locally, remotely, or automatically in adverse electrical and environmental locations. Author

N84-21111# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.

DATA FLOW COMPUTER ARCHITECTURE

Jack B. Dennis 1 Dec. 1983 11 p refs Sponsored in part by NSF

(Contract DE-AC02-79ER-10473)

(DE84-004198; DOE/ER-10473/T2) Avail: NTIS HC A02/MF A01

In the fifteen months from September 1, 1982 through November 30, 1983, the computation structures Group has continued its work toward the construction of practical data flow computers and toward their application to important practical problems. Areas in which substantial progress has been made with DOE support include the mapping of high-level programs into efficient data flow machine programs for the static data flow architecture, and the development of trial designs for some of the custom circuits needed to construct high-performance data flow computers. Studies of benchmark computational problems obtained from sponsors have been augmented through study of a plasma

simulation problem from the Los Alamos Laboratory and an image processing problem from the MIT Lincoln Laboratory. Two journal articles have been prepared to report the work on applying data flow ideas to the design of comptuer system. The first presents the proposed architecture for a high-performance data flow supercomputer, and includes an analysis of one benchmark problem, the weather model. The second article reports the principles underlying the use of dynamic data flow instruction execution to support a general purpose programming environment for a community of users. DOE

N84-21112# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Savannah River Plant.
USE OF MICROCOMPUTERS FOR INVENTORY MANAGEMENT WITH UNCERTAIN DEMAND
Betty French Meadows 1984 16 p Presented at the Am. Prod. and Inventory Control Soc. Specialty Seminar, Palm Springs, Calif., 30 Jan. - 1 Feb. 1984
(Contract DE-AC09-76SR-00001)
(DE84-005179; DP-MS-83-105) Avail: NTIS HC A02/MF A01

How a microcomputer is used for analysis of inventory trends to optimize inventory investment and customer service level in a distribution environment with uncertain demand, and to support an inventory subsystem resident on a main computer was described. A microcomputer gives the user total control over the system, immediate response, low cost, and spreadsheets for fast, accurate ongoing analysis. DOE

N84-21113# Federal Compiler Testing Center, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS DPS 6/96 COBOLR RELEASE 1.0
7 Oct. 1983 72 p
(PB84-137264; OSD/FSTC-83/261) Avail: NTIS HC A04/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, COBOL Release 1.0 running under the GCOS6 MOD400 Release 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL Standard (X3.23-1974/FIPS PUB 21-1). The compiler was validated against the High Level level of FIPS PUB 21-1. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies by level/module within X3.23-1974, a section relating the categories of discrepancies to each of the Federal Levels of the language, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21114# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
COMPUTER COMMUNICATIONS WITH MAUNA LOA SOLAR OBSERVATORY
Nov. 1983 52 p refs Sponsored in part by National Science Foundation
(PB84-137256; NCAR/TN-223-IA) Avail: NTIS HC A04/MF A01 CSCL 09B

The telephone accessed computer communications system allows realtime, near realtime, and online observations of solar corona and streamer events and also performs a variety of maintenance and communications tasks. Once in the system the remote operator can add observation data, retrieve daily weather conditions, or obtain information on previous solar events. The systems capabilities include synoptic mapping of the Sun, searching for coronal variations, and listing of the tasks accomplished by the remote operator during a given time period. M.A.C.

N84-21115# National Bureau of Standards, Washington, D.C. Center for Electronics and Electrical Engineering.
CENTER FOR ELECTRONICS AND ELECTRICAL ENGINEERING TECHNICAL PROGRESS BULLETIN COVERING CENTER PROGRAMS, OCTOBER - DECEMBER 1982 Progress Report, Oct. - Dec. 1982
J. Franklin Mayo-Wells Jul. 1983 27 p
(PB84-137322; NBSIR-83-2719) Avail: NTIS HC A03/MF A01 CSCL 09B

This is the third issue of an abstract bulletin to be issued quarterly by the Center for Electronics and Electrical Engineering, National Bureau of Standards. This issue covers the work of the Center's programs for the first quarter of Federal fiscal year 1983. Abstracts are provided by technical area for both published papers and papers approved by NBS for publication. Author

N84-21116# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
PROCEEDINGS OF THE 4TH LAN-TRANSPORT WORKSHOP
Fran Nielsen Nov. 1983 47 p refs Workshop held in Gaithersburg, Md., 27-28 Oct. 1983
(PB84-138825; NBSIR-83-2796) Avail: NTIS HC A03/MF A01 CSCL 09B

The National Bureau of Standards Institute for Computer Sciences and Technology (ICST) has prepared specifications for the International Organization for Standardization's (ISO) Class 4 Transport Protocol. At the request of a number of companies, ICST organized a workshop series for implementors of these specifications using local area networking technology. The first workshop focused on implementation techniques and strategies so that a multivendor demonstration of these protocols can occur at a major computer conference in 1984 targeted for the NCC 1984. Primarily the details of CSMA/CD and Transport Class 4 were discussed and parameters were selected. A second workshop focused on token bus LANs and file transfer applications to be run at the targeted 1984 demonstration. GRA

N84-21253# BICC Telecommunication Cables Ltd., Prescot (England). Systems Engineering Dept.
A PRACTICAL SINGLE-MODE SYSTEM, 50 km AT 140 MBIT/S
M. J. Gibson, P. Morris (Plessey), and A. Carter (Plessey) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 287-293 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/2

N84-21266# NKF Kabel B.V., Waddinxveen (Netherlands). Fibre Optics Development Group.
COMPUTERISED OPTICAL FIBRE CHARACTERISATION
Wim L. S. Mathu *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 407-413 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/2

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N84-21117*# Applied Research Corp., Huntsville, Ala.
BETA SYSTEMS ERROR ANALYSIS Final Report
26 Jan. 1984 81 p refs
(Contract NAS8-35329)
(NASA-CR-170998; NAS 1.26:170998) Avail: NTIS HC A05/MF A01 CSCL 09B

The atmospheric backscatter coefficient, beta, measured with an airborne CO Laser Doppler Velocimeter (LDV) system operating in a continuous wave, focussed model is discussed. The Single Particle Mode (SPM) algorithm, was developed from concept through analysis of ar, extensive amount of data obtained with the system on board a NASA aircraft. The SPM algorithm is intended to be employed in situations where one particle at a time appears in the sensitive volume of the LDV. In addition to giving the backscatter coefficient, the SPM algorithm also produces as intermediate results the aerosol density and the aerosol backscatter cross section distribution. A second method, which measures only the atmospheric backscatter coefficient, is called

the Volume Mode (VM) and was simultaneously employed. The results of these two methods differed by slightly less than an order of magnitude. The measurement uncertainties or other errors in the results of the two methods are examined. J.M.S.

N84-21116# RAND Corp., Santa Monica, Calif.
A PRACTICAL GUIDE TO MAXLIK
Karl Schutz Oct. 1983 70 p refs Revised
(RAND/N-1914-RC-Rev) Avail: NTIS HC A04/MF A01

Analysts interested in using maximum likelihood estimation techniques to derive estimates of the parameters for some underlying distribution may have difficulty finding software applicable to their model. The software generally available limits itself to a few specific classes of models. However, MAXLIK allows the user to specify an arbitrary likelihood function through a FORTRAN subroutine. Thus, the analyst can obtain maximum likelihood estimates for problems for which the standard statistical packages do not provide estimators. Author

N84-21119# WESTEC Services, Inc., San Diego, Calif.
LIU FAULT DIAGNOSIS INVESTIGATION Final Report, Jan. - Jun. 1983
K. J. Campbell (NOSC, San Diego, Calif.) and P. L. Stamm NOSC Nov. 1983 68 p
(Contract N00123-81-D-0437)
(AD-A137552; NOSC-TD-626) Avail: NTIS HC A04/MF A01 CSCL 09/2

This report is an investigation of the fault diagnosis algorithm attributed to Dr. Ruey-wen Liu at the University of Notre Dame. This approach is based on a faulty current concept in which a faulty component is modelled as a nominal component with a parallel fault current source. Since component faults trace a line in a measurement space as the fault current source takes on different values, measurements take on a sample circuit from a point in the measurement space. The origin of the measurement space is the intersection of the fault lines of the various circuit components and represents the circuit with all components at their nominal values. The Liu fault diagnosis approach is to determine which fault line is closest to the measurement point of the sample circuit. The circuit used to evaluate the Liu approach is an eight-resistor bridged-T dc network. This nonreactive circuit has been chosen to keep the results simple enough to provide insight into the approach. GRA

N84-21120# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
AN EXTENSION OF MATCHING THEORY
G. Cornuejols and D. Hartvigsen Nov. 1983 18 p
(Contract N00014-82-K-0329; Grant NSF ECS-82-05425)
(AD-A137605; MSRR-499) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors introduce the notion of a hypomatching in a graph G as a collection of node disjoint edges and hypomatchable subgraphs of G where the hypomatchable subgraphs belong to some prespecified family. Examples include matchings, fractional matchings and edge-and-triangle packings. It is shown that many of the classical theorems about maximum cardinality matchings can be extended to hypomatchings which cover the maximum number of nodes in a graph. Author (GRA)

N84-21121# Carnegie-Mellon Univ., Pittsburgh, Pa. Management Sciences Research Group.
COMPOSITIONS FOR PERFECT GRAPHS
G. Cornuejols and W. H. Cunningham Oct. 1983 18 p
(Contract N00014-82-K-0329; Grant NSF ECS-82-05425)
(AD-A137611; MSRR-498) Avail: NTIS HC A02/MF A01 CSCL 12/1

It is not known whether perfect graphs can be recognized in polynomial time. One attempt is to use some graph decomposition to decompose a given graph into irreducible components, i.e., components which cannot be decomposed. Perfect graphs can be recognized in polynomial time if: (1) the composition (reverse operation of the decomposition) preserves perfection; (2) reducible graphs can be decomposed in polynomial time into two smaller graphs one of which is irreducible, and (3) irreducible perfect graphs can be recognized in polynomial time. In this paper we introduce a new composition of graphs for which (1) and (2) hold. This composition generalizes clique identification, the join and the amalgam operations and, together with complementation, it encompasses all the operations preserving perfection known to us. GRA

N84-21122# Naval Research Lab., Washington, D. C. Computer Science and Systems Branch.
ACCURACY OF SOFTWARE DEVELOPMENT ACTIVITY DATA: THE SOFTWARE COST REDUCTION PROJECT Final Report, Jun. 1982 - Jun. 1983
L. J. Chmura and A. F. Norcio (U.S. Naval Academy) 30 Dec. 1983 31 p
(RR0-1409-41)
(AD-A137639; NRL-8780) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report discusses the accuracy of self-reported programmer activity data and valid ways to analyze the data. We conducted a one-week experiment during which we sampled the activities of five software engineers working on the Software Cost Reduction (SCR) project at the Naval Research Laboratory. We compared the sampled data with activity data submitted 'as usual' by the five engineers on weekly activity reports. The results indicate that the engineers report relatively accurate with the activity report if they make notes of their activity, or if they promptly submit their reports. If engineers do not keep notes of their activities, prompt reporting is critical to ensure the accuracy of reported data. The results also indicate that ratios between activity categories are valid metrics of project activity. Author (GRA)

N84-21123# Air Force Geophysics Lab., Hanscom AFB, Mass.
ATMOSPHERIC TRANSMITTANCE/RADIANCE: COMPUTER CODE LOWTRAN 6. SUPPLEMENT: PROGRAM LISTINGS
F. X. Kneizys, E. P. Shettle, W. O. Gallery, J. H. Chetwynd, Jr., and L. W. Abreu 1 Aug. 1983 196 p
(AF Proj. 7670)
(AD-A137689; AFGL-TR-83-0187-Suppl; AFGL-ERP-846-Suppl) Avail: NTIS HC A09/MF A01 CSCL 09/2

This supplement lists the LOWTRAN 6 computer code for predicting atmospheric transmittance and the thermal radiation emitted by the atmosphere and earth from 350 to 40,000 per cm at a spectral resolution of 20 per cm. The program is based on the LOWTRAN 5 (1980) computer code. Solar/lunar scattered radiation has been added to the code, as well as a new spherical refractive geometry subroutine and an improved water vapor continuum model. Other modifications to the code include a wind-dependent maritime aerosol model, a vertical structure aerosol model, a cirrus cloud model, and a rain model. The computer code contains representative (geographical and seasonal) atmospheric models and representative aerosol models with an option to replace them with user-derived or measured values. The program can be run in one of three modes, namely, to compute only atmospheric transmittance, to compute atmospheric transmittance and radiance, or to compute atmospheric transmittance, atmospheric radiance, and scattered solar/lunar background radiance for a given slant path geometry. Two new programs now available with the LOWTRAN 6 package, the plot program and the filter function program, are listed in this supplement. Author (GRA)

N84-21124# Arizona Univ., Tucson. Dept. of Aerospace and Mechanical Engineering.
DESIGN OF ARRAY PROCESSOR SOFTWARE FOR NONLINEAR STRUCTURAL ANALYSIS Technical Report, Jun. 1982 - Dec. 1983
N. Sarigul, M. Jin, R. Kolar, and H. A. Kamel Dec. 1983 41 p Presented at the ASME Winter Ann. Meeting, 13-18 Nov. 1983, Boston, Mass.
(Contract N00014-75-C-0837)
(AD-A137767; TR-10) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper presents ongoing research on the solution of large-scale nonlinear structural problems using a 32-bit minicomputer with an attached 64-bit array processor that communicate via a common memory interface. This configuration is typical of what we see as representative of future work stations with attached specialized processors. A user-oriented software package has been designed to allow the use of the given computer configuration by a typical engineer or a scientific user without a detailed knowledge of the operation of the array processor or/and the complex data handling necessary to create the manipulate the data associated with the solution of large problems. The software was then used to implement typical building blocks of a nonlinear finite element code, and performance measurements were taken. Several test examples are considered using 3-D beam finite elements and the Newton Raphson solution scheme. The array processor could not be utilized as yet, due to the lack of the proper vendor software. Hence, a simulator was designed to predict the performance of the software. The simulator was based on reliable time measurements obtained from previous work with the same array processor, using a 16-bit host computer, as well as experiments with the current 32-bit host computer. Author (GRA)

N84-21125# Northwestern Univ., Evanston, Ill. Dept. of Industrial Engineering and Management Sciences.
HIDDEN AND EMBEDDED STRUCTURE IN LINEAR PROGRAMS Final Report, 1 Oct. 1981 - 30 Sep. 1983
Robert E. Bixby 30 Sep. 1983 9 p
(Grant AF-AFOSR-0004-82; AF Proj. 2304)
(AD-A137773; AFOSR-84-0046TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

This report is a summary of work completed on AFOSR Grant AFOSR-82-0004. The summary begins with a listing of papers written followed by further descriptions of work completed as well as work in progress. Contents includes: A Simple Theorem on 3-Connectivity; A Composition for Perfect Graphs; The partial Order of a Polymatroid Extreme Point; Algorithms for Two Versions of Graph Realization and an Applicaton to Linear Programming (1983); A Note on Recognizing Path Matrices; and Packing and Covering by Integral Feasible Flows in Integral Supply-Demand Networks. GRA

N84-21126# Air Force Geophysics Lab., Hanscom AFB, Mass.
ATMOSPHERIC TRANSMITTANCE/RADIANCE: COMPUTER CODE LOWTRAN 6
F. X. Kneizys, J. H. Chetwynd, Jr., S. A. Clough, E. P. Shettle, and L. W. Abreu 1 Aug. 1983 202 p
(AF Proj. 7670)
(AD-A137786; AFGL-TR-83-0187; AFGL-ERP-846) Avail: NTIS HC A10/MF A01 CSCL 09/2

This report describes a computer code for predicting atmospheric transmittance and the thermal radiation emitted by the atmosphere and earth from 350 to 40,000 per cm at a spectral resolution of 20 per cm. The program is based on the LOWTRAN 5 computer code. Solar/lunar scattered radiation has been added to the code, as well as new spherical refractive geometry subroutines and an improved water vapor continuum model. Other modifications to the code include a wind-dependent maritime aerosol model, a vertical structure aerosol model, a cirrus cloud model, and a rain model. The computer code contains representative (geographical and seasonal) atmospheric models and representative aerosol models with an option to replace with user-derived or measured values. The program can be run in one of three modes, namely, to compute only atmospheric transmittance, to compute atmospheric transmittance and radiance, or to compute atmospheric transmittance, atmospheric radiance, and scattered solar/lunar background radiance for a given slant path geometry. Author (GRA)

N84-21127# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Computer Science.
A REVISED STONEMAN FOR DISTRIBUTED ADA (TRADEMARK) SUPPORT ENVIRONMENTS
Jeremy P. Goodwin Jan. 1984 26 p
(Contract N00014-83-K-0643)
(AD-A137940; CS830010) Avail: NTIS HC A03/MF A01 CSCL 09/2

This paper extends the conceptual model of the STONEMAN document to more completely model the interfaces and protocols that exist in the Ada Programming Support Environment (APSE). A previous extension to the STONEMAN model is reviewed and critiqued, the guidelines for the APSE set forth in STONEMAN are reviewed, and an updated model is proposed. The new model is shown to meet the guidelines set forth in STONEMAN, and to include subsequent ideas as well. The new model is then applied to the problem of user communication with an APSE, and it is shown how the new model extends to include distributed APSEs, and it is shown how the new model extends to include distributed APSEs as well as single host APSEs. The issue of security enforcement, as a necessary subset of dynamic verification, is also included in the new model. GRA

N84-21128# Boeing Aerospace Co., Seattle, Wash.
SOFTWARE QUALITY MEASUREMENT FOR DISTRIBUTED SYSTEMS, VOLUME 1 Final Technical Report, Oct. 1980 - Mar. 1983
Thomas P. Bowen, Jonathan V. Post, Juitien Tsai, P. Edward Presson, and Robert L. Schmidt Griffiss AFB, N.Y. RADC Jul. 1983 131 p 3 Vol.
(Contract F30602-80-C-0330; AF Proj. 5581)
(AD-A137955; RADC-TR-83-175-Vol-1) Avail: NTIS HC A07/MF A01 CSCL 09/2

Software metrics (or measurements) which are used to indicate and predict levels of software quality were extended from previous research to include considerations for distributed computing systems. Aspects of the products of software life-cycle activities which could affect the quality levels of software, and metrics to measure them, were identified. Two new quality factors, survivability and expandability, were validated. A Guidebook for Software Quality Measurement was produced to aid in setting quality goals, applying metric measurements, and making quality level assessments. New metrics for interoperability and reusability were also included in the guidebook. The objective of this contract was to conduct exploratory development of techniques to measure system quality with a perspective on both software and hardware from a life cycle viewpoint. The effort was expected to develop and validate metrics for software quality on networked computers and distributed systems; i.e., systems whose functions may be tightly distributed over microprocessors or specialized devices such as data base machines. At the same time, the effects hardware has on software was to be studied, as well as the trade-offs between hardware, firmware, and software. The results of this research are reported in this volume. GRA

N84-21129# Boeing Aerospace Co., Seattle, Wash.
SOFTWARE QUALITY MEASUREMENT FOR DISTRIBUTED SYSTEMS. VOLUME 2: GUIDEBOOK FOR SOFTWARE QUALITY MEASUREMENT Final Technical Report, Oct. 1980 - Mar. 1983
Thomas P. Bowen, Jonathan V. Post, Juitien Tsai, P. Edward Presson, and Robert L. Schmidt Griffiss AFB, N.Y. RADC Jul. 1983 274 p 3 Vol.
(Contract F30602-80-C-0330; AF Proj. 5581)
(AD-A137956; RADC-TR-83-175-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 09/2

Software metrics (or measurements) which are used to indicate and predict levels of software quality were extended from previous research to include considerations for distributed computing systems. Aspects of the products of software life-cycle activities which could affect the quality levels of software, and metrics to measure them, were identified. Two new quality factors, survivability and expendability, were validated. A Guidebook for Software Quality Measurement was produced to aid in setting quality goals, applying metric measurements, and making quality level assessments. New metrics for interoperability and reusability were also included in the guidebook. This volume describes the application of quality metrics to distributed systems and provides guidance for AF

acquisition managers. The guidebook provides guidance for specifying and measuring the desired level of quality in a software product. GRA

N84-21130# Boeing Aerospace Co., Seattle, Wash.
SOFTWARE QUALITY MEASUREMENT FOR DISTRIBUTED SYSTEMS. VOLUME 3: DISTRIBUTED COMPUTING SYSTEMS. IMPACT ON SOFTWARE QUALITY Final Technical Report, Oct. 1980 - Mar. 1983
Thomas P. Bowen, Jonathan V. Post, Juitien Tsai, P. Edward Presson, and Robert L. Schmidt Griffiss AFB, N.Y. RADC Jul. 1983 221 p 3 Vol.
(Contract F30602-80-C-0330; AF Proj. 5581)
(AD-A137957; RADC-TR-83-175-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 09/2

Software metrics (or measurements) which are used to indicate and predict levels of software quality were extended from previous research to include considerations for distributed computing systems. Aspects of the products of software life-cycle activities which could affect the quality levels of software, and metrics to measure them, were identified. Two new quality factors, survivability and expendability, were validated. A Guidebook for Software Quality Measurement was produced to aid in setting quality goals, applying metric measurements, and making quality level assessments. New metrics for interoperability and reusability were also included in the guidebook. This volume describes a qualitative study of distributed system characteristics, reasons for selection, design strategies, topologies, scenarios, and trade-offs. These analyses led to the changes in the Framework shown in Volume I, and to the validation of models. GRA

N84-21131# University of Southern California, Los Angeles. Dept. of Computer Science.
AN ANALYSIS OF APPLICATION GENERATORS
Ellis Horowitz, Alfons Kemper, and Balaji Narasimhan Mar. 1983 36 p
(Grant AF-AFOSR-0232-82; AF Proj. 2304)
(AD-A137159; TR-83-208; AFOSR-83-1310TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

The continuing development of higher order programming languages has not yielded major productivity improvements in the software development process. One often mentioned mechanism for achieving significant orders of improvement are application generators, such as RAMIS, NOMAD, and FOCUS. These systems have been applied to data intensive business applications with phenomenal success. The purpose of this paper is to present the basic components of application generators and show why they yield such large productivity increases in the edp environment. The authors investigate the meaning of nonprocedural programming and show how it exists in current application generators. Then they analyze the possibility of extending application generators so that they may be used for non-edp type applications.
Author (GRA)

N84-21132# Naval Postgraduate School, Monterey, Calif. Dept. of Operations Research.
NONPARAMETRIC STATISTICS TEST SOFTWARE PACKAGE M.S. Thesis
Philip J. OBrien, Jr. Sep. 1983 251 p
(AD-A137170) Avail: NTIS HC A12/MF A01 CSCL 09/2

This thesis provides the computer software to perform 24 of the most common nonparametric tests, and a text explaining how and why to use that software. Nonparametric tests are valuable to experimenters and operations analysts for three reasons: ease of explanation to non-statisticians, simplicity of computation, and applicability to data sets which cannot be analyzed by parametric tests. Reasons for unsuitability of parametric test include data of nominal or ordinal level of measurement, lack of common variance, or lack of normal distribution of the underlying population. There are two programs provided: Lochinvar, an interactive Pascal program, and Crunch, a FORTRAN program. Lochinvar is designed to prompt and screen a user's entry of data and options. Crunch performs calculations; it is suitable for use in whole or part as a subcomponent of other programs. Author (GRA)

N84-21133# Oak Ridge National Lab., Tenn. Computer Sciences.
MAPPER USER'S MANUAL
B. A. Clark, K. N. Fischer, C. W. Nestor, S. K. Penny, and D. A. Dahl (Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho) Nov. 1983 366 p refs
(Contract W-7405-eng-26)
(DE84-003478; ORNL/CSD-TM-163) Avail: NTIS HC A16/MF A01

The MAPPER program is easy-to-learn and was designed to make report-quality visual aids. The user with no previous programming experience can produce presentation slides, graphs, charts, tables, and maps on both color and black and white 35-mm microfilms, Tektronix terminals, and Versatec, Applicon and CalComp plotters. MAPPER can also be used to make 35- and 16-mm color or black and white movies. MAPPER reads English language based command files that the user has generated. An interactive editor, MAPEDIT, allows Tektronix users to add features on the scope and to have the additions automatically added to the command file. A Tektronix Graphics Tablet can be used to generate MAPPER command files directly via TABLET. DOE

N84-21134# California Univ., Berkeley. Lawrence Berkeley Lab.
OPERATION OF A COMPUTER AIDED DRAFTING SYSTEM: IMPROVEMENT, RESULTS AND HOPES
J. Millaud, F. Goulding, P. Salz, and K. Shimada Oct. 1983 12 p Presented at the 3rd DOE Workshop on Computer-Aided Eng., Livermore, Calif., 13 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005176; LBL-16805; CONF-8310160-1) Avail: NTIS HC A02/MF A01

Improvements made to the original hardware and software configuration of a two workstation computer aided drafting system are described. Benefits from this installation are reported and future developments are outlined. The time savings and quality work associated with the computer aided drafting system have generated enough interest among users to encourage them to have their drafting jobs done on the computers. DOE

N84-21135# California Univ., Livermore. Lawrence Livermore Lab.
GRAPHICS SPECIFICATION FOR GRAPHICAL REQUIREMENTS FOR COMPUTER-AIDED CONTROL SYSTEM DESIGN
Sara A. Bly Dec. 1983 28 p refs Prepared for ORNL, Tenn.
(Contract W-7405-eng-48)
(DE84-004367; UCID-19954) Avail: NTIS HC A03/MF A01

Current uses of graphics in control system design are considered in order to determine graphical requirements for a CACSD package. An overview of existing graphical capabilities is outlined, including display hardware capabilities, the current efforts at graphics standardization, and graphics software packages. The requirements and capabilities are used to suggest various options for including graphics in CACSD software packages. A specification for CACSD graphics software is outlined. DOE

N84-21136# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. Small Systems Engineering Section.
CORE GRAPHICS USERS MANUAL, REVISION 1
Wayne Little 15 Nov. 1983 120 p
(Contract DE-AC07-76ID-01570)
(DE84-004235; EGG-IS-6281-Rev-1) Avail: NTIS HC A06/MF A01

Core Graphics is a general purpose, FORTRAN callable graphics and image display software system, implemented as a FORTRAN subroutine library. Its importance and usefulness arise from its device independence and its transportability, i.e., A program written using Core Graphics may be run on any of several different graphics devices and/or CPU's without modification. Core Graphics was designed as a comprehensive integrated image and Graphic System wherein the user can manipulate two distinct data types

within the same coordinate reference frame. The Core Graphics user can handle both image and Graphic Data in the real world sense and in a standard Cartesian coordinate system without concern for the pixel (picture element) placement or vector placement in screen coordinates. Furthermore, the features of Core Graphics free the user from concerns over data acquisition and display allowing him to concentrate on the image or graphics problem at hand. DOE

N84-21137# Argonne National Lab., Ill.
MINIMAX SOLUTION OF A NONLINEAR SYSTEM OF MIXED EQUALITIES AND INEQUALITIES
U. M. Garcia-Palomares Jul. 1983 19 p refs
(Contract W-31-109-eng-38)
(DE84-003870; ANL/MCS-TM-10) Avail: NTIS HC A02/MF A01

A modification of a quadratic algorithm for solving a nonlinear system of mixed equalities and inequalities is proposed. Under suitable conditions, the modified algorithm always generates a local minimum of a function that represents the maximum violation of any equality of inequality of the system. A superlinear rate of convergence is achieved, when the maximum violation is null. Neither convexity nor constraint qualifications are required. DOE

N84-21138# Hanford Engineering Development Lab., Richland, Wash.
GUIDELINES-SOFTWARE VERIFICATION
N. P. Wilburn Aug. 1983 177 p refs
(Contract DE-AC06-76FF-02170)
(DE84-003899; HEDL-TC-2425) Avail: NTIS HC A09/MF A01

A guideline is given for verification of software products throughout the software life cycle. Concepts of verification, defects that arise in software development, software verification planning, and verification methodologies across the software life cycle are discussed extensively. The appendices present a list of verification tools and methodologies, and comprehensive checklists for the Software Requirements Specification, the Software Design Specification, the Software Description and the Code itself. DOE

N84-21139# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
AUTOMATIC, SELF-NULLING, SPECTRAL SCANNING ELLIPSOMETER: SOFTWARE FOR THE LSI-11 DATA ACQUISITION SYSTEM
R. H. Muller and J. C. Farmer Mar. 1983 338 p refs
(Contract DE-AC03-76SF-00098)
(DE83-015007; LBL-15525) Avail: NTIS HC A15/MF A01

The automatic, magneto-optic ellipsometer reported previously (1) has been given spectral scanning capabilities in the visible-UV, and has been interfaced to an LSI-11/2 for data acquisition. FORTRAN software is documented for the axquisition of both fixed-wavelength and spectroscopic data from an automatic, self-nulling ellipsometer by an LSI-11 microcomputer. This ellipsometer has resulted from the addition of spectral scanning capabilities over the visible-UV to a previously reported (1) automatic, magneto-optic instrument. Additional programs are presented to aid in the interpretation of the acquired ellipsometry data. Software is categorized as being for either (a) fixed-wavelength data collection; (b) spectroscopic data collection, reduction, and simulation; (c) graphics; or (d) modeling and optimization. The most basic ellipsometry equations have also been programmed for a Texas Instruments 59 calculator, and are presented because of their proven usefulness, convenience, and popularity. DOE

N84-21140# Stanford Univ., Calif. Systems Optimization Lab.
MINOS 5.0 USER'S GUIDE
Bruce A. Murtagh (New South Wales Univ., Kensington, Australia) and Michael A. Saunders Dec. 1983 126 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; DAAG29-81-K-0156; Grants NSF MCS-79-26009; NSF ECS-80-12974)
(DE84-005640; AD-A138522; SU-SOL-83-20) Avail: NTIS HC A07/MF A01 CSCL 09/2

MINOS is a large-scale optimization system, for the solution of sparse linear and nonlinear programs. The objective function and constraints may be linear or nonlinear, or a mixture of both. The nonlinear functions must be smooth. Stable numerical methods are employed throughout. Features include a new basis package (for maintaining sparse LU factors of the basis matrix), automatic scaling of linear contraints, and automatic estimation of some or all gradients. Upper and lower bounds on the variables are handled efficiently. File formats for constraint and basis data are compatible with the industry MPS format. The source code is suitable for machines with a FORTRAN 66 or 77 compiler and at least 500K bytes of storage. DOE

N84-21141# Sandia Labs., Albuquerque, N. Mex. Pulsed Power Engineering Div.
FLEXIBLE AUTOMATED WAVEFORM RECORDER DATA ACQUISITION PROGRAM
William B. Boyer 17 Jan. 1984 24 p refs Presented at the Instr. and Meas. Tech. Conf., Long Beach, Calif., 17 Jan. 1984
(Contract DE-AC04-76DP-00789)
(DE84-005553; SAND-83-1493C; CONF-840115-1) Avail: NTIS HC A02/MF A01

Software was developed to record signals in automated data acquisition systems that support pulsed power accelerators at Sandia. The software achieves flexibility by being entirely table driven. Before each accelerator shot the program processes input files and then sets up and checks out all programmable hardware. After the shot the program automatically reads each signal, calibrates it and stores it in a disc file. The software is currently running in 3 different facilities with up to 60 waveform recorder channels. DOE

N84-21142# Sandia Labs., Kirtland AFB, N. Mex. Analytical Thermal-Fluid Mechanics Div.
TOPAZ: A COMPUTER CODE FOR MODELING HEAT TRANSFER AND FLUID FLOW IN ARBITRARY NETWORKS OF PIPES, FLOW BRANCHES, AND VESSELS
W. S. Winters Jan. 1984 54 p refs
(Contract DE-AC04-76DP-00789)
(DE84-006275; SAND-83-8253) Avail: NTIS HC A04/MF A01

An overview of the computer code TOPAZ (Transient-One-Dimensional Pipe Flow Analyzer) is presented. The flow of compressible and incompressible fluids through complex and arbitrary arrangements of pipes, valves, flow branches and vessels is modeled by TOPAZ. Heat transfer to and from the fluid containment structures (i.e., vessel and pipe walls) are also modeled. Discussions of the fluid flow equations and containment heat conduction equations are included. The modeling philosophy, numerical integration technique, code architecture, and methods for generating the computational mesh are also discussed. DOE

N84-21143# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
FORTRAN 5 CROSS-REFERENCE
Donald J. Brenneman and Gilbert L. Singer Jan. 1984 18 p
(Contract DE-AC07-76ID-01570)
(DE84-006438; EGG-SAAM-6474) Avail: NTIS HC A02/MF A01

This manual describes FSTCOM and ROUTS, two cross-referencing programs. The programs have been prepared by EG and G Idaho, Inc. at the Idaho Nuclear Engineering Laboratory and are written in CDC FORTRAN 5, following the standard FORTRAN 77 conventions. FSTCOM and ROUTS facilitate the creation of documentation for programs. Additionally, the programs are of great help in the debugging process due to the nature of their output. To aid the user, the programs are carefully documented. In fact, most users can run FSTCOM or ROUTS by simply referring to the prologue at the beginning of each program. FSTCOM creates reports concerning the common blocks in a FORTRAN 5 program by using a FTN5 compiled listing as input. Common block information contained in the listing is collected in an interface file for future output. However, it is important to note that only the common variables actually used in the program will be stored in the interface file. ROUTS generates a report concerning the program units and the procedures they call. Like

FSTCOM, ROUTS uses a FTN5 compiled listing as input. The program unit information is collected into an interface file that is sorted by the CYBER SORT/MERGE utility to produce a report. DOE

N84-21144# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
EMACS PRIMER
Brian H. Anderson Jan. 1984 69 p
(Contract DE-AC07-76ID-01570)
(DE84-005482; EGG-IS-6511) Avail: NTIS HC A04/MF A01

Unix Emacs is an editor that is primarily used for typing in and modifying documents, programs, or anything else that is represented as text. The system uses a display to interact with the user, always keeping an accurate representation of what is happening visible on the screen that changes in step with the changes made to the documents. The feature that distinguishes Emacs from most other editors is its extensibility. A user of Emacs can dynamically change Emacs to suit their own needs. DOE

N84-21145# Massachusetts Inst. of Tech., Cambridge.
IMPLEMENTATION OF MACLISP ON A LARGE ADDRESS SPACE COMPUTER Final Report
Joel Moses 21 Dec. 1983 4 p
(Contract DE-AC02-79ER-10357)
(DE84-005042; DOE/ER-10357/1) Avail: NTIS HC A02/MF A01

This is a belated final report on the implementation of NIL - the New Implementation of LISP. Work on this project began in 1978 and is still continuing. The original timetable for the project - two years - slipped badly. Over four years were used to get a working version ready for distribution. At this point over 130 copies of the NIL System were distributed and many of the users find it superior to all available alternatives on the DEC VAX. In that sense the project was quite successful. DOE

N84-21146# Pacific Northwest Lab., Richland, Wash.
ARCHITECTURE FOR A USER INTERFACE MANAGEMENT SYSTEM
James J. Thomas Oct. 1983 7 p refs Presented at the Workshop on User Interface Management System, Frankfurt, West Germany, 1 Nov. 1983
(Contract DE-AC06-76RL-01830)
(DE84-003982; PNL-SA-11765; CONF-8311115-1) Avail: NTIS HC A02/MF A01

The term User Interface Management System has been coined to represent a set of software tools for the construction and control of the interaction dialogue between the user and the computational resource. This set of software tools will have a significant impact on the structure of applications in the future. Its advantages include faster and more reliable application development, consistent user interfaces across application domains, and easily modifiable user interfaces. Also, the user interface management systems are an essential experimental tool for research in the human computer interface. This paper describes a brief history of UIMS and an architecture for a specific UIMS to provide an adaptable user interface. DOE

N84-21147# California Univ., Livermore. Lawrence Livermore Lab.
DIGLIB FOR HP-1000 COMPUTERS
Thomas R. Treadway (General Electric Co., Sunnyvale Calif.) Nov. 1983 151 p
(Contract W-7405-eng-48)
(DE84-004741; UCRL-15570) Avail: NTIS HC A08/MF A01

Brand for DEC computers has been modified for use by HP 1000 computers running under RTE. DIGLIB consists of a small but functionally complete set of FORTRAN callable library subroutines for creating arbitrary views of two dimensional objects and for supporting interaction between the graphic application program and its user. Graphic presentation is oriented towards interactive graphic display devices (such as the HP 2648A or Tektronix 4025) and line drawing plotters (like the CalComp pen plotters). In addition, a high density Versatec V-80 or 1200 electrostatic printer/plotter interface is available. DIGLIB makes the application program independent of the specific graphic hardware devices, thereby presenting a uniform programmer interface to the graphics library, requiring few modifications (typically one) to the application program in order to accommodate a different graphics configuration. A device independent subroutine library provides a high level of program portability, allowing support of a variety of different display controllers and operating environments. DOE

N84-21148# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS DPS 8/49 FORTRAN (8) FZ3.0 Validation Summary Report
21 Oct. 1983 13 p refs
(PB84-138213; OSD/FSTC-83/273) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, FORTRAN (8) FZ3.0 running under the GCOS 8 SR2300 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21149# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS DPS 6/96 BASIC INTERPRETER RELEASE 4.0 Validation Summary Report
7 Oct. 1983 13 p refs
(PB84-139765; OSD/FSTC-83/263) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, BASIC Interpreter Rel. 4.0 running under the GCOS6 MOD400 Rel. 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 BASIC Standard (X3.60-1978/FIPS PUB 68). The compiler was validated against the Minimal BASIC level of FIPS PUB 68. The VSR is made up of several sections showing all the discrepancis found, if any. These include an overview of the validation which lists all categories of discrepancies within X3.60-1978 and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21150# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
BURROUGHS CORPORATION B3955 BURROUGHS FORT77 VERSION 6.7 Validation Summary Report.
9 Sep. 1983 16 p refs
(PB84-137223) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Burroughs Corporation, Burroughs FORT77 Version 6.7 running under the MCPVI Version 6.7 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21151# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS DPS 8/70M MULTICS FORTRAN COMPILER VERSION 10.2 Validation Summary Report
21 Oct. 1983 15 p refs
(PB84-140714; OSD/FSTC-83/272) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Honeywell Information Systems, MULTICS FORTRAN Compiler Version 10.2 running under the MULTICS Release MR10.2 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21152# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
HONEYWELL INFORMATION SYSTEMS DPS 6/96 FORTRANA RELEASE 2.1 Validation Summary Report
7 Oct. 1983 15 p refs
(PB84-141233; OSD/FSTC-83/262) Avail: NTIS HC A02/MF a01 CSCL 09B

This validation Summary Report (VSR) for the Honeywell Information Systems, FORTRANA Release 2.1 running under the GC)S6 MOD400 Release 3.0 provides a consolidated summary of the results obtained from the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full level FORTRAN level of FIPS PUB 69. The VSR is made up of several sections showing all the discrepancies found - if any. These include an overview of the validation which lists all categories of discrepancies within X3.9-1978, and a detailed listing of discrepancies together with the tests which failed. GRA

N84-21153# Office of Software Development, Falls Church, Va. Federal Software Testing Center.
CRAY RESEARCH, INCORPORATED, CRAY 1-S CRAY FORTRAN (CFT) VERSION 1.11 BUGFIX 1 Validation Summary Report
9 Sep. 1983 17 p refs
(PB84-141258; OSD/FSTC-83/215) Avail: NTIS HC A02/MF A01 CSCL 09B

This Validation Summary Report (VSR) for the Cray Research, Inc., CRAY FORTRAN Translator (CFT) Version 1.11 Bugfix 1 running under the CRAY Operating System (COS) Version 1.12 provides a consolidated summary of the results obtained form the validation of the subject compiler against the 1978 FORTRAN Standard (X3.9-1978/FIPS PUB 69). The compiler was validated against the Full Level FORTRAN level of FIPS PUB 69). The VSR is made up of several sections showing all the discrepancies found, if any. These include an overview of the validation which lists all categories of discrepancies together with the tests which failed. GRA

N84-21154 California Univ., Berkeley.
EVALUATION OF DOCUMENT RETRIEVEL RANKING ALGORITHMS Ph.D. Thesis
Eric Christian VanVliet 1983 87 p
Avail: Univ. Microfilms Order No. DA8329081

A method of evaluating the ranking algorithms that determine the output of machine based bibliographic retrieval systems is presented. The method is based on a general theoretical model that describes these rules in terms of how they weakly order a document collection. This model shows that certain ideal rules are upper bounds or large classes of ranking algorithms. The evaluation methodology measures performance by a function that gives the expected number of relevant documents for every retrieval level. By using the statistical notion of expectation it is possible to calculate a value that reflects the performance of a weak ordering for each level of retrieval. Statistical formulas make it possible to summarize the range of values from a sample population of users. Eleven different ranking algorithms are compared. Several variations of the overlap retrieval role compared with randomly ordered retrieval, can increase the expected number of relevant documents by 40%. The performance of ideal rules, constructed for the purpose of determining an upper bound on retrieval, is yet 50% greater than overlap retrieval. Dissert. Abstr.

62 COMPUTER SYSTEMS

Includes computer networks.

N84-21155# M/A-COM LINKABIT, Inc., McLean, Va.
THE DARPA INTERNET PROJECT: M/A-COM LINKABIT EASTERN OPERATION Quarterly Progress Report, 1 Apr. - 30 Jun. 1983
David L. Mills, Zorica Avramovic, and Phillip G. Gross 30 Jun. 1983 38 p
(Contract MDA903-83-C-0024)
(AD-A137661; QPR-2) Avail: NTIS HC A03/MF A01 CSCL 09/2

This second Quarterly Project Report describes Linkabit's contribution to the DARPA Internet Program during the period of 1 April through 30 June 1983. LINKABIT's efforts in support of the Internet Program are concentrated in the areas of protocol design, implementation, testing and evaluation. In addition, the group is providing integration and support services for certain computer systems to be installed at DARPA sites in Washington, D.C., and Stuttgart, West Germany. The level of staff involvement in computer systems and network support remained fairly high which indicates that the local-network configuration has not yet stabilized completely. Exterior Gateway Protol (EGP) implementation has progressed well, with test implementations converging and protocol details being finalized. Performance tests and evaluations continued with mixed results, especially with respect to FTP. In addition, several operating system enhancements were made, and bugs were fixed. GRA

N84-21156# California Univ., Berkeley. Lawrence Berkeley Lab. Engineering and Technical Services Div.
MULTIPLICATION OF PROCESSING CAPACITY WITH A PARALLEL PROCESSOR ARRAY
John Meng Oct. 1983 8 p refs Presented at the Asilomar Conf. on Circuits, Systems and Computers, Pacific Grove, Calif., 30 Oct. - 2 Nov. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004654; LBL-16194; CONF-8310194-3) Avail: NTIS HC A02/MF A01

A parallel connection of eight minicomputers is under test in an attempt to deal interactively with arrays of experimentally-generated kiloparameter data events. Computer amplification factors linearly proportional to the number of executing processors have been achieved. By replacing the minicomputers with single chip processor arrays, it is expected that there will be additional multiplication of data processing capacity. DOE

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N84-21157# Defense Systems Management School, Fort Belvoir, Va.
A SUMMARY OF PROCEEDINGS OF THE DEPARTMENT OF DEFENSE ROBOTICS APPLICATIONS WORKSHOP, VOLUME 1 (EXCLUSIVE OF PRESENTATIONS)
7 Oct. 1983 66 p Proc. held at Sacramento, Calif., 4-7 Oct. 1983
(AD-A137941) Avail: NTIS HC A04/MF A01 CSCL 05/1

An Executive Summary is provided at the beginning of this Volume and includes: (1) material on the DOD organic industrial base and its operations and processes; (2) a listing of current major DOD industrial robotics projects; and (3) the menus of needs, issues, and project ideas developed by the eight roundtables for

the ten technical topic areas. The roundtable menus constitute the primary product of the workshop. Following the Executive Summary is introductory material describing the genesis of the workshop and its organization. Abstracts of private sector expert briefs and the operations and processes briefs of the DOD activities consitute the balance of Volume 1. GRA

N84-21158# Du Pont de Nemours (E. I.) and Co., Aiken, S.C. Robotics Technology Group.
ROBOTICS AT SAVANNAH RIVER
Joseph S. Byrd 1983 14 p Presented at the DOE Robotics Seminar (IMOG), St. Petersburg, Fla., 30 Nov. 1983
(Contract DE-AC09-76SR-00001)
(DE84-003482; DP-MS-83-113; CONF-8311114-1) Avail: NTIS HC A02/MF A01

A robotics technology group was organized at the Savannah River Laboratory. Many potential applications were identified that can improve personnel safety, reduce operating costs, and increase productivity using modern robotics and automation. Several active projects are under way to procure robots, to develop unique techniques and systems for the site's processes, and to install the sytems in the actual work environments. The projects and development programs are involved in the following general applicaton areas: (1) glove boxes and shielded cell facilities; (2) laboratory chemical processes; (3) fabrication processes for reactor fuel assemblies; (4) sampling processes for separation areas; (5) emergency response in reactor areas; (6) fuel handing in reactor areas; and (7) remote radiation monitoring systems. A robotics development laboratory was set up for experimental and development work and for demonstration of robotic systems. DOE

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N84-21159# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
METHODS FOR DESCRIBING THE COEXISTENCE OF COMPETING DEGREES OF FREEDOM IN A MANY BODY SYSTEM
R. M. Quick and H. G. Miller Feb. 1983 17 p refs
(CSIR-TWISK-298) Avail: NTIS HC A02/MF A01

Methods for obtaining a description of a systems of interacting particles in which competing degrees of freedom coexist are presented and discussed. By mapping the problem onto a parametric subspace of the full Hilbert space, tractable means of handling such problems may be formulated and approximated. M.G.

N84-21160# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
MULTI-BAYESIAN ESTIMATION THEORY
D. J. deWaal (Orange Free State Univ.), P. C. N. Groenwald (Orange Free State Univ.), J vanZyl, M. (Orange Free State Univ.), and J. V. Zidek Jan. 1983 24 p refs Sponsored in part by Council for Scientific and Industrial Research and the Orange Free State Univ.
(CSIR-TWISK-296) Avail: NTIS HC A02/MF A01

A theory of multi-Bayesian estimation is developed for a fairly general group estimation problem. In particular, the class of Pareto optimal rules is characterized and multi-Bayesian versions of a complete class theorem for nonrandomized rules are proved. Finally a characterization is given of the Nash estimation procedure. M.G.

N84-21161# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
GENERALIZED DINKELBACH-TYPE ALGORITHMS
Jacob Flachs Jan. 1983 32 p refs
(CSIR-TWISK-295) Avail: NTIS HC A03/MF A01

A class of generalized Dinkelbach-type algorithms are presented together with the problems they solve and convergence properties are discussed. The algorithms which are as simple as that of Dinkelbach are applicable to classes of programs larger than fractional. In two particular cases, the first - an essentially max-mim problem, the second - a Pareto extremum, 1.61 and second order convergence is proven respectively. Applications are given to fractional max-min and Pareto extremum problems. M.G.

N84-21162# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON AN ALGORITHM FOR EXTERNAL TRIANGULATION OF ELV POLYGONS
M. Orlowski Jan. 1983 16 p refs
(CSIR-TWISK-287) Avail: NTIS HC A02/MF A01

A trivial modification of Sklansky's convex hull algorithm can be applied to find an external triangulation of externally left visible polygons in linear running time. The computational complexity of external triangulation polygons is of the same degree as Sklansky's convex hull algorithm. M.A.C.

N84-21163# National Mechanical Engineering Research Inst., Pretoria (South Africa).
AN ACCURATE AND ECONOMICAL PLATE-BENDING HYBRID FINITE ELEMENT
H. Alaylioglu [1983] 20 p refs
Avail: NTIS HC A02/MF A01

An accurate and economical hybrid finite element is developed for the bending analysis of thin plates. To reduce the computational cost of the hybrid element, the element properties are represented in an algorithmic form which enables the automatic generation of the stiffness matrix without numerical integration. By using this automatic generation facility, a series of stress and displacement fields are considered and their effects on the performance of the element are analyzed for the solutions of typical test problems. The element which provides the most efficient solutions for both displacements and stresses is recommended for general-purpose program libraries. M.G.

N84-21164# Illinois Univ., Urbana-Champaign. Dept. of Physics.
BACKWARD MOVING ALTARELLI-PARISI EQUATIONS FOR TRANSVERSE MOMENTUM CALCULATIONS IN JETS
L. M. Jones and R. Migneron (Western Ontario Univ.) Feb. 1984 29 p refs Sponsored in part by National Science and Engineering Council of Canada and North Atlantic Treaty Organization
(Contract DE-AC02-76ER-01195)
(ILL-(TH)-84-10) Avail: NTIS HC A03/MF A01

Equations for various jet calculus propagators in which the mass of the partons evolves down were developed; these are in some sense just the inverse of the normal Altarelli-Parisi equations in which the jet mass evolves up. The new backward moving equations are preferable for calculations of transverse momentum distributions because they have a simpler separation of the transverse and longitudinal momentum variables. DOE

N84-21165*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STABILITY OF FINITE DIFFERENCE MODELS CONTAINING TWO BOUNDARIES OR INTERFACES Final Report
Lloyd N. Trefethen Mar. 1984 50 p refs
(Contract NAS1-17070)
(NASA-CR-172319; ICASE-84-11; NAS 1.26:172319) Avail: NTIS HC A03/MF A01 CSCL 12A

The stability of finite difference models of hyperbolic initial boundary value problems is connected with the propagation and reflection of parasitic waves. Wave propagation ideas are applied to models containing two boundaires or interfaces, where repeated reflection of trapped wave packets is a potential new source of instability. Various known instability phenomena are accounted for in a unified way. Results show: (1) dissipativity does not ensure stability when three or more formulas are concatenated at a boundary or internal interface; (2) algebraic GKS instabilities can be converted by a second boundary to exponential instabilities only when an infinite numerical reflection coefficient is present;

and (3) GKS-stability and P-stability can be established in certain problems by showing that all numerical reflection coefficients have modulus less than 1. A.R.H.

N84-21166# Stanford Univ., Calif. Information Systems Lab.
AN OVERVIEW OF RECURSIVE LEAST SQUARES ESTIMATION AND LATTICE FILTERS
John M. Turner Jan. 1984 72 p
(Contracts N00014-82-K-0492; MDA903-82-K-0382)
(AD-A137554; ISL-TR-M736-2) Avail: NTIS HC A04/MF A01 CSCL 12/1

This overview presents the derivation of the recursive least squares lattice filter using a recursive extension of the standard block data Levinson least squares solution. The linear predictor filter presented here has been widely used for synthesis of speech waveforms, deconvolution of seismic data, high resolution spectral estimation, adaptive line enhancement, adaptive noise cancelling and adaptive antenna array processing. The ideas embodied in this estimation technique are derived from the work of many individuals since 1970. GRA

N84-21167# Stanford Univ., Calif. Dept. of Computer Science.
NUMERICAL METHODS FOR PARTIAL DIFFERENTIAL EQUATIONS Final Report, 15 Aug. 1982 - 14 Aug. 1983
Robert Schreiber 9 Jan. 1984 105 p
(Contract N00014-82-K-0703)
(AD-A137624) Avail: NTIS HC A06/MF A01 CSCL 12/1

The focus of research was the application of systolic array architectures to computations in numerical linear algebra, and the applications of these architectures to digital signal processing and elliptic partial differential equations (PDE). Research was conducted on a number of topics: matrix triangularization by systolic arrays; singular value and eigenvalue computations; elliptic PDE; and updating Cholesky factorizations. GRA

N84-21168# Naval Research Lab., Washington, D. C. Marine Systems Branch.
OPTIMAL CONTROL AND FILTER GAINS FOR THE STATIONARY CONTINUOUS OR DISCRETE TIME LQG PROBLEM - A FORTRAN PROGRAM Final Report, Oct. 1982 - Sep. 1983
C. D. Ozimina 6 Jan. 1984 32 p
(RR0-2301-41)
(AD-A137667; AD-E000561; NRL-MR-5239) Avail: NTIS HC A03/MF A01 CSCL 12/1

The eigenvalue eigenvector method is used to compute the constant linear quadratic control and Kalman filter gains for the stationary continuous and discrete LQG control problem. A listing of a simple FORTRAN program is provided. GRA

N84-21169# Illinois Univ., Chicago. Dept. of Mathematics, Statistics and Computer Science.
COMPONENT RELEVANCY IN MULTISTATE SYSTEMS
Emad El-Neweihi and Frank Proschan (Florida State Univ.) Sep. 1983 12 p
(Contract F49620-82-K-0007; Grant AF-AFOSR-0170-80; AF Proj. 2304)
(AD-A137727; FSU-STATISTICS-M670; AFOSR-84-0048TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

The authors define a hierarchy of six successively weaker conditions for component relevancy in a multistate structure of M+1 performance levels. They show that the six conditions are distinct except for M=1,2. Presented are basic structural properties corresponding to the six conditions: (1) the definition and properties of the dual structure, (2) redundancy at a lower level is preferable to redundancy at a higher level, and (3) the definition and properties of the structural importance of components. Author (GRA)

N84-21170# American Coll. Testing Program, Iowa city, Iowa.
AN APPLICATION OF A MULTIDIMENSIONAL EXTENSION OF THE TWO-PARAMETER LOGISTIC LATENT TRAIT MODEL
R. L. McKinley and M. D. Reckase Aug. 1983 54 p
(Contract N00014-81-K-0817; RR0-4204)
(AD-A137741; RR-83-3-ONR) Avail: NTIS HC A04/MF A01 CSCL 12/1

Latent trait theory has become an increasingly popular area for research and application in recent years. Areas where latent trait theory has been applied include test scoring, criterion-referenced measurement, test equating, tailored testing, and mastery testing. While many of these applications have been successful, one unsolved problem is repeatedly encountered. Most latent trait models assume a unidimensional latent trait. As a result, applications of these models have been limited to areas in which the tests used measure predominantly one factor. When the assumption of unidimensionality is not met, such as is often the case with achievement tests, most latent trait models are inappropriate. The purposes of the research presented here are to describe a latent trait model that is appropriate for use with tests that measure more than one dimension and to demonstrate its application to both real and simulated test data. In addition, procedures for estimating the parameters of the model will be presented. The objectives of this research are to determine whether the proposed model more adequately explains multidimensional test data than does the unidimensional version of the model, and to determine whether the results yielded by the application of the model are consistent with the results of another, more established multivariate data reduction procedure, factor analysis. GRA

N84-21171# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
RESEARCH IN ALGEBRAIC MANIPULATION Interim Report, 1 Jul. 1981 - 30 Jun. 1982
Joel Moses 26 Jun. 1983 5 p
(Grant AF-AFOSR-0250-80; AF Proj. 2304)
(AD-A137742; AFOSR-84-0036TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document indicates that research on the integration of algebraic functions was phased down and a new line of research on the solution of ordinary differential equations in closed form begun. GRA

N84-21172# Stevens Inst. of Tech., Hoboken, N. J. Dept. of Mechanical Engineering.
TIME DOMAIN ANALYSIS AND SYNTHESIS OF ROBUST CONTROLLERS FOR LARGE SCALE LQG (LINEAR QUADRATIC GAUSSIAN) REGULATORS Final Report, 1 Sep. 1982 - 31 Aug. 1983
R. K. Yedavalli, R. N. Shanbhag, and J. Irudayasamy 31 Aug. 1983 56 p
(Grant AF-83-0139; AF Proj. 2304)
(AD-A137760; AFOSR-84-0040TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

The aspect of robustness for linear multivariable systems is analyzed in time domain. Both stability robustness and performance robustness are combinedly considered to meet stability and performance requirements. First a stability robustness condition in time domain (in terms of eigenvalues) is presented and examples are given which indicate that the proposed robustness condition is less conservative then the corresponding frequency domain condition as well as another recently proposed time domain condition, both given in terms of singular values. Next a technique is presented to further reduce the conservatism of the proposed condition. A design algorithm that incorporates both stability robustness and performance robustness into the design procedure suggested in the summer faculty program report, is modified with the help of new definitions of robustness indices. Computer software to implement the algorithm is presented along with simple examples to illustrate the concepts. Based on the experience gained by the minigrant research, areas of future research are recommended. Author (GRA)

N84-21173# American Coll. Testing Program, Iowa city, Iowa. Resident Programs Dept.
AN EXTENSION OF THE TWO-PARAMETER LOGISTIC MODEL TO THE MULTIDIMENSIONAL LATENT SPACE
Robert L. McKinley and Mark D. Reckase Aug. 1983 32 p
(Contract N00014-81-K-0817; NR Proj. RR0-4204; NR Proj.

150-474)
(AD-A137769; RR-83-2-ONR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A multidimensional extension of the two-parameter logistics latent trait model is presented and some of its characteristics are discussed. In addition, sufficient statistics for the parameters of the model are derived, as is the information function. Finally, the estimation of the parameters of the model using the maximum likelihood estimation technique is also discussed. Author (GRA)

N84-21174# Massachusetts Inst. of Tech., Cambridge. Lab. for Computer Science.
RESEARCH IN ALGEBRAIC MANIPULATION Interim Report, 1 Jul. 1982 - 30 Jun. 1983
Joel Moses 14 Dec. 1983 11 p
(Grant AF-AFOSR-0250-80; AF Proj. 2304)
(AD-A137776; AFOSR-84-0037TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Professor Shunro Watanabe of Japan has been visiting our group since March, 1982. In the past year he has been able, with the support of our group, to develop a major new program for solving in closed from a wide variety of ordinary differential equations. The MACSYMA system uses two large packages for solving ODES. Professor Watanabe's approach is to convert most second order ODEs into instances of the so-called P-function. These functions, originally due to Riemann, have been extensively studied by the Japanese mathematician Fukuhara (also spelled Hukuhara). For the past year, Watanabe has implemented a package that transforms a large class of equations into P-functions. He has used Kamke's table as a test bed. Several examples from Kamke using this package, are given in Appendix 1. GRA

N84-21175# La Jolla Inst., Calif. Center for the Study of Nonlinear Dynamics.
FRACTAL PHASE SCREENS Final Report, 1 May 1982 - 30 Apr. 1983
Bruce J. West Jun. 1983 34 p
(Contract F49620-82-C-0058; AF Proj. 2310)
(AD-A137804; LJI-R-83-236; AFOSR-84-0053TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

A plane wave emergent from a scattering layer is modeled as a boundary value problem. The wave is specified at $z = 0(+)$ by a unit amplitude and a phase prescribed by a homogeneous isotropic random function with a power law spectrum and Gaussian statistics. It is shown that the statistics of the wave propagating in free space away from the boundary cannot be Gaussian, except perhaps in the far field region where the scattering is saturated. It is also shown that the amplitude and intensity spectra of this wave each satisfy specific scaling relations. Such a wave has been called a diffractal by Berry and herein this paper further develops some of his ideas on diffractals, in particular extending his discussion from two or three spatial dimensions. A study of the scintillation index indicates that a diffractal is not an unreasonable model of a radio wave passing through the ionosphere, as it does in satellite communication. Author (GRA)

N84-21176# Wisconsin Univ., Madison. Dept. of Statistics.
SMOOTHING, REGULARIZATION AND ILL-POSED INVERSE PROBLEMS; ROBUST AND CONVEX ESTIMATION OF FUNCTIONS OF SEVERAL VARIABLES Final Report, 1 Sep. 1977 - 30 Sep. 1983
Grace Wahba 29 Dec. 1983 11 p
(Contract DAAG29-80-K-0042; Grant DAAG29-77-G-0207)
(AD-A137810; ARO-14891-MA; ARO-17339.11-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

Many problems were studied during the six year period of this research, 1 September 1977-30 September 1983 under the two titles: Smoothing, Regularization, and Ill-Posed Inverse Problems and Robust and Convex Estimation of Functions of Several Variables and Associated Design Problems, Sixteen Technical Reports and twenty papers and discussions appeared in the open literature. Briefly, the problems studied fall in three classes: Problems density estimation, problems in experimental design, and problems in the estimation of functions of one of several variables given noisy observations on functionals and various types of side and or prior information. GRA

N84-21177# Georgia Inst. of Tech., Atlanta. School of Mathematics.
LINEAR OR NONLINEAR WAVE PROBLEMS WITH INPUT SETS Final Report, 14 Jun. 1981 - 31 Oct. 1983
W. F. Ames 21 Dec. 1983 8 p
(Contract DAAG29-81-K-0042)
(AD-A137811; ARO-17723.7-MA) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report presents a review of results and a list of publications. Results presented concern the group analysis of hyperbolic and parabolic systems, their types of solutions and numerical enclosure of their solutions when input data sets are present. GRA

N84-21178# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
HARMONY THEORY: A MATHEMATICAL FRAMEWORK FOR STOCHASTIC PARALLEL PROCESSING
Paul Smolensky Dec. 1983 21 p
(Contracts N00014-79-C-0323; Grant PHS-MH-14268)
(AD-A137883; ICS-8306; Rept-8304-ONR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Given a set of stimuli presenting views of some environment, how can one characterize the natural modules or objects that compose the environment? Should a given set of items be encoded as a collection of instances or as a set of rules? Restricted formulations of these questions are analyzed within a new mathematical framework that describes stochastic parallel computation. An algorithm is given for simulating this computation once schemas encoding the modules of the environment have been selected. The concept of computational temperature is introduced. As this temperature is lowered, the system appears to display a dramatic tendency to coherently interpret input, even if the evidence for any particular interpretation is very weak. Author (GRA)

N84-21179*# Wisconsin Univ., Madison. Mathematics Research Center.
NUMERICAL SCHEMES FOR A MODEL FOR NONLINEAR DISPERSIVE WAVES Technical Summary Report
J. L. Bona (Chicago Univ., Ill.), W. G. Pritchard (Essex Univ., Colchester, Engl.), and L. R. Scott (Michigan Univ., Ann Arbor) Nov. 1983 36 p
(Contracts NAS1-14101; DAAG29-80-C-0041; F49620-79-C-0149; EY-36-C-02-0016)
(NASA-CR-175416; NAS 1.26:175416; AD-A137920; MRC-TSR-2604) Avail: NTIS HC A03/MF A01 CSCL 12A

A description is given of a number of numerical schemes to solve an evolution equation (Korteweg-deVries) that arises when modelling the propagation of water waves in a channel. The discussion also includes the results of numerical experiments made with each of the schemes. It is suggested, on the basis of these experiments, that one of the schemes may have (discrete) solitary-wave solutions. Author (GRA)

N84-21180# Wisconsin Univ., Madison. Mathematics Research Center.
RANDOMIZED ESTIMATORS FOR TIME INTEGRALS Technical Summary Report
Peter W. Glynn Nov. 1983 41 p
(Contract DAAG29-80-C-0041)
(AD-A137921; MRC-TSR-2603) Avail: NTIS HC A03/MF A01 CSCL 12/1

This document considers a stochastic system for which one needs an estimate of the expected discounted cost over the infinite horizon. Standard Monte Carlo procedures do not apply since the parameter to be estimated involves values of the process over an infinitely long time interval. This paper, presents Monte Carlo estimation techniques, based on randomization, that can be used in the above setting. The techniques developed turn out to be more efficient than the standard approach, even when the

parameter to be estimated cumulates costs over a finite time interval. Author (GRA)

N84-21181# Wisconsin Univ., Madison. Mathematics Research Center.
NEW EXACT SOLUTIONS IN NON-LINEAR ELASTICITY Technical Summary Report
K. R. Rajagopal (Pittsburgh Univ., Pa.) and A. S. Wineman (Michigan Univ., Ann Arbor) Jan. 1984 30 p
(Contract DAAG29-80-C-0041; Grant NSF MEA-82-18226)
(AD-A137928; MRC-TSR-2618) Avail: NTIS HC A03/MF A01 CSCL 12/1

Since Rivlin's pioneering work in the non-linear theory of elasticity there have been few new solutions which have been exhibited. This work establishes exact solutions to several boundary value problems in the theory of non-linear elasticity. A remarkable feature in all the problems dealt with is the possibility of an infinity of exact solutions. Author (GRA)

N84-21182# Wisconsin Univ., Madison. Mathematics Research Center.
THE AUTOCORRELATION FUNCTION OF SEASONAL ARMA MODELS Technical Summary Report
Daniel Pena (Madrid Univ., Spain) Dec. 1983 10 p Sponsored in part by US-Spanish Joint Committee for Educational and Cultural Affairs
(Contract DAAG29-80-C-0041)
(AD-A137929; MRC-TSR-2612) Avail: NTIS HC A02/MF A01 CSCL 12/1

This note obtains the theoretical autocorrelation function of an Autoregressive Moving Average (ARMA) model with multiplicative seasonality. It is shown that this function can be interpretated as the result of the interaction between the seasonal and regular autocorrelation patterns of the ARMA model. The use of this result makes easier the identification of the structure of the model, is helpful in choosing between a multiplicative or additive seasonal component and leads to a better understanding of the properties of the estimated autocorrelation function of scalar ARMA processes. Author (GRA)

N84-21183# Wisconsin Univ., Madison.
A BIVARIATE C-2 CLOUGH-TOCHER SCHEME Technical Summary Report
Peter Alfeld (Utah Univ., Salt Lake City) Jan. 1984 38 p Sponsored in part by the Utah Univ. Research Committee
(Contracts DAAG29-80-C-0041; DE-AC02-82ER-12046)
(AD-A137930; MRC-TSR-2620) Avail: NTIS HC A03/MF A01 CSCL 12/1

A Clough-Tocher like interpolation scheme is described for values of position, gradient and Hessian at scattered points in two variables. The domain is assumed to have been triangulated. The interpolant has local support, is globally twice differentiable, piecewise polynomial, and reproduces polynomials of degree up to three exactly. Author (GRA)

N84-21184# Wisconsin Univ., Madison. Mathematics Research Center.
THE DIRICHLET-NEUMANN BOUNDARY CONTROL PROBLEM ASSOCIATED WITH MAXWELL'S EQUATIONS IN A CYLINDRICAL REGION Technical Summary Report
D. L. Russell Dec. 1983 52 p
(Contract DAAG29-80-C-0041; Grant AF-AFOSR-0018-79)
(AD-A137937; MRC-TSR-2614) Avail: NTIS HC A04/MF A01 CSCL 12/1

In a cylindrical region the author considers electromagnetic fields independent of the axial coordinate: controlling the time evolution of such fields by means of boundary currents, likewise independent of the axial direction, is equivalent to controlling, simultaneously, two wave equations; one with boundary control of Dirichlet type, the other of Neumann type. This paper provides a preliminary study of control problems of this type and indicate what is necessary for extensions of our work. Author (GRA)

N84-21185# Wisconsin Univ., Madison. Mathematics Research Center.
COMPARISON OF THE DICHOTOMOUS AND POLYCHOTOMOUS QUANTAL RESPONSE MODELS Technical Summary Report
Siu-Keung Tse and C. F. Jeff Wu Dec. 1983 26 p
(Contracts DAAG29-80-C-0041; DAAG29-82-K-0154)
(AD-A137938; MRC-TSR-2607) Avail: NTIS HC A03/MF A01 CSCL 12/1

A class of polychotomous quantal response models is defined, including the dichotomous response model. As an application of the Missing Information Principle, it is shown that the Fisher information for the common parameters in the more elaborate model is greater. For the logistic curve and several design schemes, the above result is supported in a numerical study. For estimating the common parameters of the dichotomous-response and trichotomous-response models and the percentiles of the common tolerance curve, an extensive simulation study shows that in general the latter model gives more accurate estimates than the former one. The situations in which such gains are substantial are identified. Author (GRA)

N84-21186# Illinois Univ., Chicago. Dept. of Quantitative Methods.
ON SEGMENTATION OF DIGITAL IMAGES USING SPATIAL AND CONTEXTUAL INFORMATION VIA A 2-DIMENSIONAL MARKOV MODEL
Stanley L. Sclove 6 Dec. 1983 11026 p Presented at the Workshop on Appl. Pattern Recognition and Image Analysis, Providence, R.I., 14-16 Apr. 1983 Submitted for publication
(Contract DAAG29-82-K-0155)
(AD-A137942; UIC/DQM/A83-2; ARO-19085.6-MA) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of partitioning a digital image into segments is considered. First the procedure is illustrated for the analogous one-dimensional problem, namely, segmentation of time series. Then similar ideas are applied to the segmentation of digital images. The segments are considered as falling into classes. A probability distribution is associated with each class of segment. Parametric families of distributions are considered, a set of parameter values being associated with each class. With each observation is associated an unobservable label, indicating from which class the observation arose. The label process is modeled as a Markov process. Segmentation algorithms are obtained by applying a method of iterated maximum likelihood (a relaxation method) to the resulting likelihood function. In this paper special attention is given to the situation in which the observations are conditionally independent, given the labels. Numerical examples are given. Choice of the number of classes, using statistical model-selection criteria, is illustrated. Author (GRA)

N84-21187# Wisconsin Univ., Madison. Mathematics Research Center.
NORMAL MODES OF A LAGRANGIAN SYSTEM CONSTRAINED IN POTENTIAL WELL Technical Summary Report
V. Benci (Bari Univ., Italy) Dec. 1983 32 p
(Contract DAAG29-80-C-0041)
(AD-A137948; MRC-TSR-2610) Avail: NTIS HC A03/MF A01 CSCL 12/1

The question of existence and the number of periodic solutions (normal modes) for a classical mechanical system is a problem as old as the field of analytical mechanics itself. The development of the nonlinear functional analysis has renewed interest in these problems. This paper considers a mechanical system which is constrained in a potential well. GRA

N84-21188# Wisconsin Univ., Madison. Mathematics Research Center.
SIMPLE COMPUTABLE BOUNDS FOR SOLUTIONS OF LINEAR COMPLEMENTARITY PROBLEMS AND LINEAR PROGRAMS Technical Summary Report
O. L. Mangasarian Nov. 1983 25 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-82-00632)

(AD-A137949; MRC-TSR-2611) Avail: NTIS HC A02/MF A01 CSCL 12/1

Surprisingly simple bounds are given for solutions of fundamental constrained optimization problems such as linear and convex quadratic programs. It is shown that every nonoptimal primal-dual feasible point carries within it simple numerical information which bounds some or all components of all solution vectors. The results given permit one to compute bounds without even solving the optimization problems. Author (GRA)

N84-21189# Wisconsin Univ., Madison. Mathematics Research Center.

A TOPOLOGICAL VERSION OF A THEOREM OF MATHER ON TWIST MAPS Technical Summary Report

Glen Richard Hall Dec. 1983 31 p Sponsored in part by NSF (Contract DAAG29-80-C-0041)

(AD-A137950; MRC-TSR-2615) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report shows that a twist map of an annulus with a periodic point of rotation number p/q must have a Birkhoff periodic point of rotation number p/q. Topological techniques are used so no assumption of area-preservation or circle intersection property is needed. If the map is area preserving then this theorem and the fixed point theorem of Birkhoff imply a recent theorem of Mather. It is also shown that periodic orbits of (significantly) smallest period for a twist map must be Birkhoff. Author (GRA)

N84-21190# Wisconsin Univ., Madison. Mathematics Research Center.

MINIMAX METHODS FOR INDEFINITE FUNCTIONALS Technical Summary Report

Paul H. Rabinowitz Jan. 1984 31 p

(Contract DAAG29-80-C-0041; Grant NSF MCS-81-10556)

(AD-A137953; MRC-TSR-2619) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper contains the written of a series of lectures presented by the author at the American Mathematical Society Summer Institute on Nonlinear Functional Analysis and Nonlinear Differential Equations. These lectures are an introduction to minimax techniques for finding critical points of functionals, especially functionals possessing symmetries. Applications are made to semilinear elliptic partial differential equations and Hamiltonian systems of ordinary differential equations. Author (GRA)

N84-21191# California Univ., Livermore. Lawrence Livermore Lab.

GENERALIZATION OF THE NUMERICAL SCHWARZ ALGORITHM

G. Rodrique and J. Simon 1983 13 p refs Presented at the 6th Intern. Conf. on Computing Methods in Appl. Sci. and Eng., Paris, 12 Dec. 1983

(Contract W-7405-eng-48)

(DE84-003735; UCRL-90030; CONF-831256-1) Avail: NTIS HC A02/MF A01

The Schwarz alternating method of decomposing the domain has been found to be an effective means for solving elliptic partial differential equations on a multiprocessing computing system. The method is recast into numerical linear algebra so that classical techniques of acceleration can be applied. Computational results using an incomplete-factorization as a pre-conditioner are given. A study of the effects of convergence by varying the subdomains is made. DOE

N84-21192# Colorado Univ., Colorado Springs. Dept. of Computer Science.

MOVING FINITE ELEMENTS IN 1-D: A REVIEW OF THE METHOD AND THE CODING EXPERIENCE

Richard Sincovec and Sohail Aslam Sep. 1983 134 p refs

(Contract W-7405-eng-48)

(DE84-004821; UCRL-15572) Avail: NTIS HC A07/MF A01

A code was developed which can solve a system of nonlinear partial differential equations (PDE) using the moving finite element (MFE) method. Its capabilities were demonstrated by presenting solutions for Burger's equation, reactive and non-reactive square waves, and Maxwell's equations. Compared to conventional numerical packages, some of which allow the user almost hands off computing, the MFE code places a large burden on the user. A suitable way for selecting the number nodes to use and how to place them initially was not developed. Choosing the optimum values for constants in the regularization term is pure guess work (or so it seems). This number node selection and placement, combined with the selection of error tolerances for the ODE integrator, and selection of suitable weights for the PDE's, makes obtaining results within a suitable amount of time and effort difficult. If the parameters are right, the results obtained are indeed remarkable. If all the given work could somehow be avoided, the MFE method is a very powerful tool. DOE

N84-21193# Sandia Labs., Albuquerque, N. Mex. Numerical Mathematics Div.

INTERPOLATION FOR RUNGE-KUTTA METHODS

Lawrence F. Shampine Jan. 1984 33 p refs

(Contract DE-AC04-76DP-00789)

(DE84-006455; SAND-83-2560) Avail: NTIS HC A03/MF A01

Runge-Kutta methods provide a popular way to solve the initial value problem for a system of ordinary differential equations. In contrast to the Adams methods, there is no natural way to approximate the solution between mesh points. A way to accomplish this is proposed which is applicable to some important formulas. Its theoretical support is much better than that of interpolation in the popular variable order, variable step Adams codes. DOE

N84-21194# New York Univ., New York. Lab. for Mathematics and Computing.

EVALUATION OF STEP DIRECTIONS IN OPTIMIZATION ALGORITHMS

William C. Davidon (Haverford College) and Jorge Nocedal Dec. 1983 15 p refs

(Contract DE-AC02-76ER-03077)

(DE84-006044; DOE/ER-03077/206) Avail: NTIS HC A02/MF A01

A method for comparing that part of optimization methods which chooses each step direction is presented. It is an example of a general approach to algorithm evaluation in which one tests specific parts of the algorithm, rather than making overall evaluations on a set of standard test problems. The testing procedure can be useful for developing new algorithms and for writing and evaluating optimization software. The method is used to compare two versions of the conjugate gradient algorithm, and to compare these with an algorithm based on conic functions. DOE

N84-21195# Illinois Univ., Urbana. Dept. of Computer Sciences.

SYSTEMS OF NONLINEAR ALGEBRAIC EQUATIONS ARISING IN SIMULATION OF SEMICONDUCTORS DEVICES Ph.D. Thesis

Qasim M. Sheikh Oct. 1983 59 p refs

(Contract DE-AC02-76ER-02383)

(DE84-006490; UILU-ENG-83-1721; COO-2383-0096; UIUCDCS-R-83-1133) Avail: NTIS HC A04/MF A01

Several formulations of the system of nonlinear elliptic partial differential equations modeling semiconductor devices are presented. The equations are discretized using finite difference techniques, and a class of Newton-like methods based on splittings of the Jacobians are developed. Sufficient conditions for convergence of these methods are stated and proved. A multigrid method for solving the nonlinear semiconductor equations is also described, and numerical examples are presented illustrating its efficiency and utility. DOE

N84-21196# California Univ., Berkeley. Lawrence Berkeley Lab.

LIE ALGEBRAIC METHODS FOR PARTICLE TRACKING CALCULATIONS

David R. Douglas and Alex J. Dragt (Maryland Univ., College Park) Aug. 1983 5 p refs Presented at the 12th Intern. Conf. on High

Energy Accelerators, Batavia, Ill., 11 Aug. 1983
(Contracts DE-AC03-76SF-00098; DE-AS05-80ER-10666)
(DE84-004310; LBL-16008; CONF-830822-49) Avail: NTIS HC A02/MF A01

A study of the nonlinear stability of an accelerator or storage ring lattice typically includes particle tracking simulations. Such simulations trace rays through linear and nonlinear lattice elements by numerically evaluating linear matrix or impulsive nonlinear transformations. Using the mathematical tools of Lie groups and algebras, one may construct a formalism which makes explicit use of Hamilton's equations and which allows the description of groups of linear and nonlinear lattice elements by a single transformation. Such a transformation will be exactly canonical and will describe finite length linear and nonlinear elements through third (octupole) order. It is presently possible to include effects such as fringing fields and potentially possible to extend the formalism to include nonlinearities of higher order, multipole errors, and magnet misalignments. This Lie algebraic formalism and its use in particle tracking calculations is outlined. A computer code, MARYLIE, was constructed on the basis of this formalism. The use of this program for tracking and examples of its application are described. DOE

N84-21197# Argonne National Lab., Ill. Mathematics and Computer Science Div.
EISPACK: A PACKAGE FOR SOLVING MATRIX EIGENVALUE PROBLEMS
J. J. Dongarra and C. B. Moler (New Mexico Univ., Albuquerque) Aug. 1983 27 p refs
(Contract W-31-109-eng-38)
(DE84-005408; ANL/MCS-TM-12) Avail: NTIS HC A03/MF A01

The development and usage of the software package EISPACK is discussed. Changes made to the package for the current release and how to install the package are described. EISPACK is a systemized collection of subroutines that compute the eigenvalues and eigenvectors of different classes of matrices. DOE

N84-21198# Sandia Labs., Albuquerque, N. Mex. Applied Mathematics Div.
LOCATION ERRORS IN TIME-OF-ARRIVAL TYPES OF SYSTEMS WITH AUGMENTING EQUATIONS
Eugene A. Aronson Dec. 1983 31 p refs
(Contract DE-AC04-76DP-00789)
(DE84-006250; SAND-83-2325) Avail: NTIS HC A03/MF A01

The mean and covariance of object location errors in time-of-arrival (TOA), time-difference-of-arrival (TDOA), and time-squared-difference (TSQD) systems are estimated in this report. These errors are due to errors in the assumed locations of the devices sensing the TOA data and in the measurement of the TOA data itself. Also given is an analysis of the errors in these systems if the model vector is augmented with constraint-like equations. In the somewhat special case where system three-space geometry induces large location error covariances, an analysis is presented of the errors in an approximating two-space system. DOE

N84-21199# Los Alamos Scientific Lab., N. Mex. Theoretical Div.
FAMILY OF ALMOST PERIODIC SCHROEDINGER OPERATORS
George A. Baker, Jr., Daniel Bessis (CEA), and Pierre Moussa (CEA) 1983 27 p refs Presented at the 7th Intern. Conf. on Math. Phys., Boulder, Colo., 1 Aug. 1983
(Contract W-7405-eng-36)
(DE83-017308; LA-UR-83-2295; CONF-8308153-1) Avail: NTIS HC A03/MF A01

Bellisard et al introduced a one dimensional, almost-periodic, discrete Schroedinger operator which is defined by a parameter lambda. This parameter is allowed to become complex, and a geometric formalism is developed to control the operator. The support of the spectrum of this operator is the Julia set of the mapping x(2) - lambda yields x. It is proved that the almost-periodicity holds over wide regions of the complex lambda-plane, even though Hermiticity fails. DOE

N84-21200# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.
CHIRAL ANOMALIES AND DIFFERENTIAL GEOMETRY
Bruno Zumino and K. Sibold (Geneva Univ., Switzerland) Oct. 1983 25 p refs Presented at the Lectures in Phys., Les Houches, France, 1 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE84-004637; LBL-16747; CONF-8308144-1) Avail: NTIS HC A02/MF A01

Some properties of chiral anomalies are described from a geometric point of view. Topics include chiral anomalies and differential forms, transformation properties of the anomalies, identification and use of the anomalies, and normalization of the anomalies. DOE

N84-20537*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
APPLICATION OF IMPROVED NUMERICAL SCHEMES
G. H. Neely *In its* Combust. Fundamentals Res. Apr. 1984 p 95-96 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 12A

N84-20540*# Toledo Univ., Ohio.
GRID FLEXIBILITY AND PATCHING TECHNIQUES
T. G. Keith, L. W. Smith, C. N. Yung, S. H. Barthelson, and K. J. DeWitt *In* NASA. Lewis Research Center Combust. Fundamentals Res. Apr. 1984 p 103-114 refs (For primary document see N84-20525 11-07)
Avail: NTIS HC A14/MF A01 CSCL 12A

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N84-21201# Stanford Univ., Calif. Dept. of Statistics.
STATIONARY STOCHASTIC ASYMMETRIC CONTROL Technical Report
Howard Weiner 18 Jan. 1984 11 p
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A137565; SU-TR-341) Avail: NTIS HC A02/MF A01 CSCL 12/1

This document describes a one-dimensional problem which deals with the minimization of a cost function. Generalizations to a multi-dimensional case are mentioned. GRA

N84-21202# North Carolina Univ., Chapel Hill. Dept. of Statistics.
RESEARCH IN STOCHASTIC PROCESSES Interim Report, 1 Nov. 1982 - 31 Oct. 1983
Stamatis Cambanis, Raymond J. Carroll, Gopinath Kallianpur, and M. Ross Leadbetter Oct. 1983 62 p
(Contract F49620-82-C-0009; AF Proj. 2304)
(AD-A137736; AFOSR-84-0011TR) Avail: NTIS HC A04/MF A01 CSCL 12/1

This document addressed the following topics: (1) nonlinear systems with random inputs; (2) non-Gaussian signal processing; (3) digital processing of analog signals; (4) finitely additive nonlinear filtering; (5) Feynman integrals; (6) multiple stochastic integrals; (7) Dousker's delta functional; (8) extremal theory under high local dependence; (9) high level exceedances by stationary point processes; and (10) estimation for stochastic processes. Robust estimation for linear models was also discussed. GRA

N84-21203# Wisconsin Univ., Madison. Mathematics Research Center.
ON THE LOGICAL DEVELOPMENT OF STATISTICAL MODELS Technical Summary Report
Daniel Pena (Univ. Polytecnica de Madrid, Spain) Dec. 1983 28 p Sponsored in part by US-Spanish Joint Committee for Educational and Cultural Affairs
(Contract DAAG29-80-C-0041)

(AD-A137936; MRC-TSR-2608) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper presents a classification of statistical models using a simple and logical framework. Some remarks are made about the historical appearance of each type of model and the practical problems that motivated them. It is argued that the current stages of the statistical methodology for model building have arisen in response to the needs of more sophisticated procedures for building dynamic-explicative types of models. Some potentially important topics for future research are included. Author (GRA)

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N84-21204 Illinois Inst. of Tech., Chicago.
APPLICATIONS OF OPERATIONS RESEARCH AND MANAGEMENT INFORMATION SYSTEM CONCEPTS TO MANAGEMENT OF LARGE SOFTWARE PROJECTS Ph.D. Thesis
John Hearn Lee 1983 159 p
Avail: Univ. Microfilms Order No. DA8400839

As demands for large-scale software systems increase, improvement of software productivity has become an important goal. Achieving this goal requires efficient management of software development staff and computing resources through effective and timely planning and control decisions. Such decisions are possible when software systems are decomposed into components and life-cycle stages of developing these components are mathematically modeled. Incorporating staff consumption, resource usage and their relationships with time as tradeoffs into the model, the minimum cost, minimum duration and maximum profit project plans can be generated. For generating the plans, heuristic algorithms are formulated. The algorithms attempt to search for close-to-optimal project milestones, and from them, derive staff and resource needs. Reduction of the resulting computational cost, when compared with analytical methods, is significant. Three operations research oriented project management algorithms are presented. Dissert. Abstr.

N84-21205# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
THE NUMERICAL SOLUTION OF THREE STOCHASTIC DIFFERENTIAL GAMES
Y. Yavin Feb. 1983 60 p refs
(CSIR-TWISK-292) Avail: NTIS HC A04/MF A01

Stochastic versions of three differential games, namely: the blocking game, the game of patrolling a channel, and the collision avoidance game, are considered. The common factor of these differential games is that all three of them are modelled by the same group of stochastic differential equations. In each of the games, sufficient conditions on optimal strategies in the case of complete observation, and sufficient conditions on weak optimal strategies in the case of partial observations are derived. In the cases of complete observation, optimal strategies are computed for a variety of cases. In the cases of partial observation, procedures for computing weak suboptimal strategies are suggested, and these are computed for a variety of examples. M.G.

N84-21206# RAND Corp., Santa Monica, Calif.
THE SUBJECTIVE FUNCTION APPROACH FOR ANALYZING SYSTEMS
Clairice T. Veit and Monti Callero Jun. 1983 42 p refs
(RAND/P-6893) Avail: NTIS HC A03/MF A01

The Subjective Transfer Function (STF) approach is a subjective measurement method for analyzing complex systems where many factors either directly or indirectly impact on system outcomes. The measurement problem is one of constructing these descriptions from experimental designs that allow effects of the information contained in the descriptions on judged outcomes to be measured. The algebraic modeling approach to subjective measurement provides this capability. This approach is the measurement basis of the STF approach. The features of the algebraic modeling approach are discussed and these features which provide resolutions to measurement problems found with other commonly used approaches are described. The STF approach incorporates basic features to the algebraic modeling approach and provides additional features to handle complex systems. Examples from research in tactical air command and control are used to illustrate the steps involved in applying the STF approach. Author

N84-21207# Naval Postgraduate School, Monterey, Calif. Dept. of Administrative Science.
AN EXPECTED VALUE AIR COMBAT MODEL SIMULATION ALGORITHM TO PREDICT MISSIONS PERFORMANCE IN TACTICAL AIR OPERATIONS M.S. Thesis
Efstratios Skliris Sep. 1983 213 p
(AD-A137651) Avail: NTIS HC A10/MF A01 CSCL 15/7

This thesis intends to create the basic conceptual background for a nonexpert analyst so as to be able to follow the logic, structure, development, and utility of an Air Combat Model, using the digital computer. Initially the reader will be introduced to the concepts, methods and present constraints of Modeling and Simulation focused on Air Operations. Then the thesis will demonstrate a basic application of an air combat model simulation algorithm called 'ICARUS'. The model developed in this study is a highly aggregated Theater-Level model which utilizes the allocation of aircraft in various missions on a daily basis to obtain the outcome of an offensive versus defensive systems engagement. The simulation algorithm which supports the model consists of an air portion including a limited number of factors to accomplish the main objective--to give insight capabilities to a non-expert reader. Author (GRA)

N84-21208# Massachusetts Univ., Amherst. Dept. of Mathematics and Statistics.
APPLICATIONS OF FUNCTIONAL ANALYTIC AND MARTINGALE METHODS TO PROBLEMS IN QUEUEING NETWORK THEORY Annual Scientific Report, 15 May 1982 - 14 May 1983
Walter A. Rosenkrantz 14 May 1983 5 p
(Grant AF-AFOSR-0167-82; AF Proj. 2304)
(AD-A137748; AFOSR-84-0030TR) Avail: NTIS HC A02/MF A01 CSCL 12/2

Research continues on the performance analysis of random access communications systems and the stability of a protocol for accessing a communications channel. The Laplace transform of the length of the busy period for the M/G/1 queue via Martingales was calculated and diffusion for a class of Markov processes satisfying a nonlinear Fokker-Planck equation was approximated. Investigations show that the SLOTTED ALHOA multiaccess algorithm is strongly unstable, i.e., transient via a Martingale method of independent interest. The weak convergence of a sequence of queueing and storage processes to a singular diffusion was also studied. The stability of the exponential back off algorithm for an ETHERNET type access system is being examined. Author (GRA)

N84-21209# Wisconsin Univ., Madison. Mathematics Research Center.
DIFFERENTIAL GAMES, OPTIMAL CONTROL AND DIRECTIONAL DERIVATIVES OF VISCOSITY SOLUTIONS OF BELLMAN'S AND ISAACS' EQUATIONS Technical Summary Report
P. L. Lions (Paris Univ., France) and P. E. Souganidis (Brown Univ., Providence, R.I.) Jan. 1984 37 p
(Contract DAAG29-80-C-0041; Grant NSF MCS-80-02946)
(AD-A137939; MRC-TSR-2621) Avail: NTIS HC A03/MF A01 CSCL 12/1

Recent work by the authors and others has demonstrated the connections between the dynamic programming approach to optimal control theory and to two-person, zero-sum differential games problems and the new notion of viscosity solutions of

Hamilton-Jacobi PDE's introduced by M. G. Crandall and P. L. Lions. In particular, it has been proved that the dynamic programming principle implies that the value function is the viscosity solution of the associated Hamilton-Jacobi-Bellman and Isaacs equations. In the present work, it is shown that viscosity super- and subsolutions of these equations must satisfy some inequalities called super- and subdynamic programming principle respectively. This is then used to prove the equivalence between the notion of viscosity solutions and the conditions, introduced by A. Subbotin, concerning the sign of certain generalized directional derivatives.
Author (GRA)

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N84-21210# Los Alamos Scientific Lab., N. Mex.
SEMIGROUP ASSOCIATED WITH A QUASI-LINEAR SYSTEM IN WHICH THE COUPLING IS LINEAR
George H. Pimbley 1983 19 p refs Presented at the Am. Math. Soc. Summer Workshop, Berkeley, Calif., 11-29 Jul. 1983 (Contract W-7405-eng-36)
(DE84-004227; LA-UR-83-3545; CONF-8307111-1) Avail: NTIS HC A02/MF A01

Semigroup solution was successful mainly for linear and mildly nonlinear initial value problems having but a single partial differential equation (PDE). Attempts to apply standard semigroup generation principles to systems of nonlinear PDEs caused difficulties, though papers appeared that treated mildly nonlinear systems. Ideas involving the Trotter product formula that were efficacious in finding semigroups for coupled systems of quasi-liner PDEs were demonstrated. This was a class for which semigroup generation principles involving accretiveness of an operator had generally failed. These Trotter product ideas were explained used a profound Banach manifold approach. DOE

N84-21211# Stanford Univ., Calif. Systems Optimization Lab.
DECOMPOSITION AND SCALING-INEQUALITY FOR LINE-SUM-SYMMETRIC NONNEGATIVE MATRICES
George B. Dantzig, B. Curtis Eaves, and Uriel G. Rothblum (Yale Univ., New Haven, Conn.) Dec. 1983 14 p refs
(Contracts DE-AT03-76ER-72018; DE-AM03-76SF-00326; N00014-75-C-0267; Grants NSF MCS-81-19774; NSF MCS-79-26009; NSF ECS-80-12974; NSF MCS-81-21838; NSF ECS-78-25182; NR Proj. 047-143)
(DE84-005639; SU-SOL-83-21) Avail: NTIS HC A02/MF A01

A matrix B is called line-sum-symmetric if it is square and the sum of elements in each row of B equals the sum of elements in the corresponding column. Results from the theory of network flows are used to obtain a decomposition of nonnegative line-sum-symmetric matrices. The decomposition is employed to prove the following inequality: Assume D(x)AD(y) is line-sum-symmetric where A is a square, nonnegative matrix and D(x) and D(y) are diagonal matrices whose diagonal elements are the coordinates of the nonnegative vectors x and y, respectively. Then y/sup T/Ax greater than or equal to x/sup T/Ay. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N84-21212# Army Communications-Electronics Command, Fort Monmouth, N.J.
PROCEEDINGS OF THE 32D INTERNATIONAL WIRE AND CABLE SYMPOSIUM
1983 467 p refs Symp. held in Cherry Hill, N.J., 15-17 Nov. 1983
(AD-A136749) Avail: NTIS HC A20/MF A01 CSCL 05/2

Areas of concern discussed, were: current trends in local area networks, fiber optics, cable design, and safety factors. For individual titles, see N84-21213 through N84-21270.

N84-21213# Telecom Australia Research Labs., Melbourne. Cable Design and Specifications Section.
USE OF PLAIN COPPER CONDUCTORS IN LIEU OF TINNED-COPPER FOR INTERNAL CABLES c33
Robert T. deBoer and Ken G. Mottram *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 1-8 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

In line with most Telephone Operating Administrations, Telecom Australia has specified and used tinned-copper conductors, with PVC insulation and sheathing, for most internal cabling within telephone exchanges and subscribers' buildings. Following some reported problems associated with solderability, an investigation showed that the current production tinned conductors in Australia were inadequately specified; however, the excellent performance of plain copper prompted a more detailed investigation which revealed that plain copper conductors (i.e., no tinning) were suitable for all current applications of internal cable. The study covered soldering, wire wrapping, and insulation displacement terminations. As a result of this work, Telecom Australia has adopted plain copper as the standard for internal cables. This decision has resulted in both an improved performance in comparison with the previous tinned conductors (particularly in relation to solderability) and a substantial cable cost reduction. Author

N84-21214# Sumitomo Electric Industries Ltd., Kanuma (Japan). Electronics Wire Div.
DEVELOPMENT OF COPPER-COATED ALUMINUM-SHIELDED WIRE c33
Haruo Saen and Akinori Mori *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 9-16 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Aluminum-shielded wires are usually used in short lengths of about 200 millimeters in many electronic devices because of their easy termination. However, some problems have occurred in shield effect. The authors have found that this is due to the increase of contact resistance between the aluminum and the drain wire, which is caused by aluminum oxide. To overcome this problem, they developed a new shield tape composed of aluminum foil laminated with polyester film and having a copper layer over the aluminum face. The contact resistance between the shield tape and the drain wire could thus be reduced and was found to be very stable. A wire spirally wrapped and shielded with this new tape has very stable shield effect when subjected to a humid environment or H2S environment, even in short lengths of 100 mm. The authors also developed a new construction for the spirally wrapped shield which is very useful and reliable for multi-conductor wires having individually insulated and shielded conductors. Author

N84-21215# Tobyhanna Army Depot, Pa. Production Engineering Div.
ALUMINUM FOIL SHIELD EFFECTIVENESS FOR ELECTRONIC CABLES c33
Michael R. Lombardo *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 17-23 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Historically, shielding of electronic cables has been expressed in terms of shield coverage. The numerical value used to delineate shield coverage corresponded to the actual area of the conductors covered by the cable shield. Generally, the larger the percentage of coverage the greater the shield's effectiveness. Presently, with the advent of more sensitive, more sophisticated equipment 100% shield coverage has not been totally adequate. Shield effectiveness can be defined as the functional capability of a shield. The shield must present any external signal from entering the conductors and also present the conductors from radiating signals beyond the shield. Both parameters of this function are important, but not

necessarily proportional. This problem of proportionality occurs primarily in the type cable described herein. Author

N84-21216# Bell Telephone Labs., Inc., Norcross, Ga.
UNBALANCED DIGITAL CROSSWALK IN BALANCED, TWISTED PAIR, INSIDE WIRING CABLE **c32**
Dan P. Woodard, Jr. *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 24-29 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 12/1

A model is derived that accurately predicts pulse crosstalk between two unbalanced circuits in a multipair cable. If pair integrity is maintained and single point grounding is observed, coupling is capacitive and increases directly with length. If unused conductors are allowed to float, coupling capacitance increases strongly, but predictably. Based on this model, twisted pair inside wiring cables are capable of transmitting digital signals over longer distances and at greater rates than those recommended in industry standards. Author

N84-21217# Sumitomo Electric Industries Ltd., Yokohama (Japan). Communication System Engineering Section.
DESIGN AND CHARACTERISTICS OF RADIATING PAIR CABLE **c33**
Noriyuki Tago, Hiroshi Satani, Yoshio Miyamoto, and Yoshikazu Amano *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 30-36 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The radiation theory of sources located at a constant interval on a straight line is well known in the Leaky Wave Guide and the technique has been applied to the Leaky Coaxial Cable. In the Radiating Pair Cable (RPC), the technique is applied by twisting a cable pair at constant pitch and lay in the cable. The expression of the radiation field of the RPC was derived and it showed that the RPV gave an optimum distribution of the source for radiation. Author

N84-21218# Bell Telephone Labs., Inc., Holmdel, N. J. Transmission Systems Group.
NEW QUALITY ASSESSMENT PROCEDURE FOR EXCHANGE AREA CABLE TRANSMISSION PARAMETERS **c33**
P. Allen Link *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 37-44 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

To best represent the customers' needs, a method of evaluating the transmission quality of exchange area cable must have representative requirements, a statistically powerful method of evaluating the conformance of cables to the requirements and a means of combining the results in a fashion that reflects the end use of the product. The method described herein utilizes a requirement structure containing nominal and maximum requirements to define a desirable distribution for each parameter. Author

N84-21219# Bell Telephone Labs., Inc., Norcross, Ga. Lightguide Joining Group.
BELL SYSTEM LIGHTGUIDE CABLE INTERCONNECTION EQUIPMENT, CENTRAL OFFICE TO CUSTOMER PREMISES **c33**
Manfred R. Gotthardt *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 45-48 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Lightguide cable interconnection equipment furnishes the interface between outside plant and central office, remote terminal, or customer premises transmission equipment. Primarily, the interconnection equipment provides a convenient centralized access point for cabled optical fibers, lightguide cable sheath termination, and other functions such as; fiber organization, fiber storage, and the accommodation of splices and connectors. Since the installation of the first Bell System lightwave system, several different types of interconnection equipment units have been developed. These provide and interconnection capability from the central office to customer premises. Described in this paper are the design approaches taken to develop this equipment and short descriptions of the units. Author

N84-21220# Thomson-CSF, Conflans-Sainte-Honorine (France). L.T.T. Cable Div.
TERMINATION OF CYLINDRICAL GROOVED OPTICAL CABLES **c33**
Andre Bouvard, Jean Pierre Hulin (Raychem), Michel deVecchis, and William J. Poulson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 49-53 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

A zero loss termination system adapted to cylindrical grooved (or slotted core) cables is described that provides individual protection of each fiber at a breakout point without the need to cut or splice the fibers. Applications of this device are described, for example, the design of termination subassemblies (cable termination boxes, distribution frames, drop terminals) in the French wired city of BIARRITZ, cable splicing organization including high density cables and various subassemblies for videocommunication networks. Author

N84-21221# Tokyo Electric Power Co., Inc. (Japan). Engineering Development Div.
FIELD TRIAL OF COMPOSITE FIBER-OPTIC OVERHEAD GROUND WIRE **c32**
Simao Kubota, Hiroyoshi Kawahira, Tatsuo Nakajima, Ichiro Matsubara (Sumitomo Electric Ind., Ltd.), Yasunori Saito (Sumitomo Electric Ind., Ltd.), and Yoshinobu Kitayama (Sumitomo Electric Ind., Ltd.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 54-62 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 17/2

A composite fiber-optic ground wire (OPGW), which provides additional communication capabilities for system protection and control of overhead power transmission systems has been developed. After laboratory tests, the OPGW was strung along a live power transmission line in a mountainous region and has been confirmed to have sufficient performance to establish a high-speed digital transmission network able to withstand actual conditions. The field line, constructed substantially by existing techniques, has proved that the new OPGW, accessories such as clamps and joint boxes, installation technique, and on-tower splicing method can be effectively utilized to produce a protection and control system with extremely stable characteristics. Author

N84-21222# Corning Glass Works, N.Y. Waveguide Product Engineering Lab.
FACTORY SPLICING OF OPTICAL WAVEGUIDE FIBER **c74**
Donald H. Taylor and Stuart L. Saikkonen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 63-69 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20F

The increasing need for longer and longer link lengths, and reclamation of shorter lengths, reinforce the continued need for permanent low loss joints between optical fibers. In support of this need, the authors have directed efforts toward the optimization of fusion splicing in a factory environment. The goal of the present work was to develop a process for the splicing of optical fibers utilizing standard arc fusion techniques. The resultant spliced fibers are to be indistinguishable from unspliced fiber with respect to fiber and coating geometries. In addition, the same stringent mechanical and environmental performance requirements must be met. Tests on a large number of factory splices will be discussed and performance results given. Author

N84-21223# Furukawa Electric Co. Ltd., Tokyo (Japan). Fiber Optics Apparatus Group.
FABRICATION AND EVALUATION OF A HIGH DENSITY MULTI FIBER PLASTIC CONNECTOR **c33**

Shigeru Tachigami, Akihiro Ohtake, Takehiro Hayashi, Takaaki Iso, and Tohro Shirasawa *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 70-75 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

This connector is made by direct-molding a five-fiber tape using transfer-molding machine, so that it may be small in size, high in precision, low in cost, and easy to assemble. This connector has dimensions of 5 mm (t) x 13 mm(W) x 10 mm(L) and fiber space is 0.3 mm and alignment-hole space is 7 mm; five fibers of 0.125 mm in diameter and two alignment-holes of 1.4 mm in diameter are positioned in the line in the center of end face. The guide rod which is inserted in the alignment-hole has a diameter of 1.4 mm + or - 0.5 micron. Author

N84-21224# AMP, Inc., Harrisburg, Pa.
LEAD MAKING FOR IMPROVED CONTINUOUS-FLOW MANUFACTURING SYSTEMS c31
Paul Heintzman *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 76-82 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/8

The importance of the latest in connector technology, chip carriers, surface mounted devices, and high density interconnects not withstanding, the foreseeable future of most durable goods includes designs in which discrete wires play a significant role. As long as user operated electro-mechanical controls exist for widely spaced functional components such as motors, relays, and safety switches, discrete wiring harnesses will continue to be a major concern of original equipment manufacturers. Economy and productivity must be maintained in spite of competitive pressures which demand expanded product lines and carefully controlled component inventories, manufacturing schedules, and deliveries. This paper explores some of the options available to answer these needs as they relate to discrete wiring and harnessing. Not only is available manufacturing hardware analyzed in terms of production capabilities but also in-house and vendor supply source alternatives are considered. Author

N84-21225# Firet B.V., Veenendaal (Netherlands).
LONGITUDINAL WATERBLOCKING PERFORMANCE OF CONDUCTIVE AND NON-CONDUCTIVE WATERSWELLABLE NONWOVENS c33
Ben J. Nieuwhof and Roelf deVrieze *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 83-87 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Since the introduction of plastic insulated cables for transport of energy and telecommunication networks, longitudinal water penetration has become a subject of major interest. Besides already introduced systems like Aquablock, petrolatum filling, steel jackets etc., water expandable tapes offer a distinct solution to the so called longitudinal water ingress into the cable interstices. The tape have been developed in cooperation with European cable-makers and a practical experience of three years is available now. Power cables have been subjected to the French FDF test where water penetration during functioning of the cable has been measured. Besides measurements on the cable itself the lecture will propose a measurement method for swellable effectiveness and control. Other phenomena regarding interaction between metallic screens and the tape, temperature electrical resistivity and long term stability will be reported. Author

N84-21226# Bell Telephone Labs., Inc., Norcross, Ga. Chemical Engineering Group.
EVALUATION OF ADHESIVE MATERIALS FOR BONDED SHEATH CABLE DESIGNS c27
A. C. Levy and B. J. Overton *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 88-93 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/1

Bonded sheath cable designs require bond stability over the wide range of environmental extreme experienced by the cable prior to, during and after installation. In order to select acceptable sheath bonding materials, short term laboratory tests were developed which would predict long term performance. These tests include one which predicts long term bond performance at high temperature in a pressurized environment, and one which correlates with low temperature buckling performance of the cable during installation. The effect of shield corrugations on bond strength is also discussed. Author

N84-21227# Ciba-Geigy A.G., Basel (Switzerland). Polymer Additive Dept.
NEW DATA ON LONG TERM STABILIZATION OF POLYETHYLENE FOR TELECOMMUNICATION WIRE INSULATION c33
Felix K. Meyer and Helmut Linhart *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 94-104 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Medium density polyethylene is widely used for the insulation of telecommunication wires. A lifetime of 40 to 50 years is generally desired. Thus the stabilization of the polyethylene in contact with copper is of prime importance. In this paper new data pertaining to the long term heat stabilization are presented. The loss of stabilizers as a function of time is examined and aging data on actual wires are shown. There is evidence that polyethylene stabilized with a combination of a sterically hindered phenolic antioxidant (penetaerythrityl tetrakis (3.5-di-t-butyl-4-hydroxyphenyl propionate) and a copper deactivator (N, N'-bis (beta-3.5-di-t-butyl-4-hydroxypenyl-propiono) hydrazide) has good chances of reaching the expected lifetime. Author (GRA)

N84-21228# Telecom Australia Research Labs., Melbourne. Polymer Section.
BEHAVIOUR OF FOUR NON-MIGRATORY ANTIOXIDANTS IN SOLID POLYETHYLENE INSULATION c27
H. J. Ruddell, D. J. Adams, P. Latoszynski, and Bob T. deBoer *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 104-110 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/7

An earlier investigation into premature cracking of solid polyethylene insulation of telecommunication cables in above ground joints identified the cause as early depletion of antioxidant. A contributing factor was found to be the loss of antioxidant by migration. Consequently, antioxidants were sought with minimal migration from polyethylene at service temperatures up to 60 C. Tests conducted showed that four out of 14 phenolic antioxidants investigated exhibited negligible migration, and were considered suitable for further examination. Large reaction losses, however, were found with all four antioxidants when used alone in the presence of copper, and this was not altered by the use of a secondary antioxidant. These losses were reduced to negligible proportions with only two of the antioxidants when used in combination with metal deactivators. As a result of this work, studies are in progress to determine the capability of these two stabilizing systems to protect solid medium density polyethylene for more than 40 years under adverse thermal conditions. Author (GRA)

N84-21229# Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Fluoropolymer Div.
EQUIPMENT AND DESIGN CHANGES IN EXTRUSION OF FOAMED FLUOROPOLYMER RESINS c33
Stuart K. Randa, Mark A. Carlson, and David P. Reifschneider *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 111-118 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Recent growth of computer networks has increased the market for foamed coaxial cables. To meet this need, the gas injection process for foaming of Teflon* FEP and PFA fluorocarbon resins introduced in 1981 at the 30th Wire and Cable Symposium has been refined. Advances in die and extruder screw design have broadened capability from 500 CATV coaxial cable to miniature wire sizes. Increased processing speeds and higher core quality

have been achieved. These coaxial cables have a unique combination of properties that are maintained over a wide range of temperatures and signal frequencies. They have dielectric constants as low as 1.3 and low flame spread and smoke generation as tested to UL 910. These cables are now widely used for high frequency signal transmission in compliance with the National Electric Code for installation without conduit in building air handling plenums. Military applications represent newer areas of interest with weight and space savings and high electrical quality. The characteristics of several coaxial cables are reviewed.
Author (GRA)

N84-21230# Pennwalt Corp., King of Prussia, Pa. Flourochemicals Div.
FOAMABLE PVDF FLUOROPLASTIC FOR WIRE AND CABLE APPLICATIONS **c27**
Roger L. Pecsok and Oliver Odhner *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 119-124 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/9

A foamable polyvinylidene fluoride (PVDF) resin which meets the UL 910 flammability classification has been developed for wire and cable applications. The foamable PVDF composition is based on a chemical blowing agent system which is thermally activated during extrusion. Extrusion and wire coating conditions for the preparation of foamed PVDF insulation will be discussed. Electrical and mechanical properties of the foam insulation are presented with reference to the foam density and cell size. Author (GRA)

N84-21231# Sumitomo Electric Industries Ltd., Osaka (Japan). Photonics Project Group.
DEVELOPMENT OF COMPOSITE FIBER-OPTIC ELECTRIC-POWER UMBILICAL CABLE AND OPTICAL FEEDTHROUGH FOR DEEP OCEAN MINING **c33**
Tsutomu Mitsui, Takeshi Gomi, Tetsuji Ito, Shigefumi Ushitani, and Masayoshi Yamaguchi *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 125-133 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The development of mining systems for mineral resources from deep ocean floors is now progressing in many countries. In Japan, the Agency of Industrial Science and Technology, has conducted research and development for a manganese nodule mining system. In this project, it is planned to use a new composite fiber-optic electric power umbilical cable for electrical power and control signal transmission from a main vessel to subsea equipment such as lifting pumps and collecting devices at about 5,000 meters' depth. The umbilical cable system is required to have good resistance to repetitive bending, twisting, and other external forces and to be able to withstand water pressure of up to 550kgf/sq cm. A 100m long sample umbilical cable, electrical connectors, and optical feedthroughs for this system have been developed and successfully passed mechanical, electrical, and optical tests. Author (GRA)

N84-21232# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
ANALYSIS OF EXCESS ATTENUATION IN OPTICAL FIBERS SUBJECTED TO LOW TEMPERATURES **c74**
Powers Garmon *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 134-143 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

Optical fibers which exhibit a dual coating comprised of a low modulus inner layer and a high modulus outer layer at times display excessive attenuation increase at low temperatures. The excess loss may be attributed in part to forces exerted on the optical fiber by the polymer coatings as the temperature decreases, thereby resulting in fiber bending. Fiber bending may occur if the optical fiber assumes a spiral configuration within the low modulus primary coating due to thermal contraction of the secondary coating. Defects in fiber coatings, such as coating eccentricity, fluctuations in coating thickness, and voids between primary and secondary layers, may amplify excess attenuation as the fiber temperature decreases. Author (GRA)

N84-21233# Bell Telephone Labs., Inc., Murray Hill, N. J. Plastics Applied Research, Properties and Processing Group.
BUCKLING OF OPTICAL FIBERS WITHIN ELASTOMERS USED IN AN EMBEDDED-CORE CABLE STRUCTURE **c74**
Lee L. Blyler, Jr., Czeslaw Gieniewski, Xina Quan, and Hany Ghoneim *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 144-150 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

Optical fibers must be packaged in cable structures such that transmission losses due to microbending are minimized. In an embedded core cable structure, the fibers are helically stranded within a core consisting of a central strength member surrounded by a low modulus elastomeric buffer in which the fibers are embedded. Excess losses due to fiber buckling within the elastomer may be incurred with this structure as a result of axial compressive loading of the fibers during cable bending. An experimental technique has been developed to evaluate the tendency of an optical fiber to buckle within the elastomer of an embedded core cable. The technique utilizes a sample in which a coated fiber is molded into a sandwich structure. The tendency to buckle is shown to be strongly related to the modulus of the elastomers high modulus elastomers provide buckling stability. The adhesive and frictional forces between the fiber coating and the elastomer are also obtained with the sandwich specimen. Adhesive failure and fiber slippage are shown to be compressive strain relief mechanisms with certain elastomers. In addition, a mechanism of fiber failure due to localized buckling is observed within high modulus, highly adherent elastomer when fibers are subjected to large compressive strains (greater than 3%). Author (GRA)

N84-21234# Belden Corp., Chicago, Ill. Product Development Dept.
DESIGN ASPECTS OF LOOSE BUFFER TUBE FIBER OPTICS CABLE **c33**
Ronald L. Ohlhaber *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 151-154 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The theory and operation of cables which employ loose buffer tubes to contain optical fibers is discussed. These cables permit tradeoffs between physical strength, temperature range and structural dimensions. Specific examples show how the materials and cable construction can be controlled to yield the desired performance. GRA

N84-21235# Tohoku Electric Power Co., Inc., Sendai (Japan). Integrated Communication Network Development Office.
NON-METALLIC OPTICAL CABLE WITH OPTICAL FIBER CATENARY FOR LONG SPAN AERIAL APPLICATION **c33**
Eiji Hayasaka, Fujio Ohtsuk, Masaki Monma, Sakari Ohira, Hiroaki Horima (Sumitomo Electric Ind., Ltd.), Katsumi Yamashita (Sumitomo Electric Ind., Ltd.), Masahiko Dazai (Sumitomo Electric Ind., Ltd.), and Hoboru Abe (Kitanihon Electric Wire Co., Ltd.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 155-166 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

A nonmetallic prehanger type self supporting optical fiber cable with optical fiber catenary was developed and is considered to have a long term operating capability under high tension and abnormal freak weather conditions. The nonmetallic optical fiber cable is intended to be extremely effective for long span aerial cable mounting on all types of overhead poles and power transmission towers. Moreover, this type of cable has particular resistance to the accumulation and forming of ice or snow on the cable sheath which was observed during field test investigations.
Author (GRA)

N84-21236# AEG-Telefunken, Moenchengladbach (West Germany). Optical Fiber Div.
NON-METALLIC LONG SPAN AERIAL CABLE WITH OPTICAL FIBRES FOR THE USE AT 1.3 MICROMETERS **c33**
Helmut G. Haag and Peter E. Zamzow *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 167-174 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

For the use in overhead power lines the application of fully dielectric optical fiber cables is very useful. It is shown, that it is possible to construct long span aerial cables for spanwidths of up to 1000 m. First results in test installations with graded index and single mode fibers at 850 and 1300 nm are reported. From these results estimations for system designs are derivated.Author (GRA)

N84-21237# Dow Corning Corp., Midland, Mich.
NEW SILICON RUBBER CABLE INSULATION PROMISES CIRCUIT INTEGRITY, IN FLAMING ENVIRONMENT **c33**
Melvin A. Cabey *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 175-182 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

To provide an improved alternative to fluoropolymers and other halogenated materials used for insulation of most plenum cables, a project was undertaken to develop silicone elastomers which would meet Steiner Tunnel test criteria. Equally important, the project aimed to retain the long recognized ability of silicone elastomers to form a nonconductive ash when burned. The new material resulting from this project provides improved flame retardancy and lower smoke density, without sacrificing the best flame environment properties of earlier silicone rubbers. It does not melt, flow or drip, and burns to form a ceramic that clings to the conductors. This nonconductive ceramic has enough strength to remain in place during and after burning, thus providing insulation between adjacent conductors to assure circuit integrity.
Author (GRA)

N84-21238*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A POLYTETRAFLUORETHYLENE INSULATED CABLE FOR HIGH TEMPERATURE OXYGEN AEROSPACE APPLICATIONS **c33**
Alvin T. Sheppard (Martin Marietta Aerospace) and Robert G. Webber *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 183-192 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09A

For electrical cables to function and survive in the severe high temperature oxygen environment that will be experienced in the external tanks of the space shuttle, extreme cleanliness and material purity is required. A flexible light weight cable has been developed for use in pure oxygen at worst case temperatures of -190 to +260 degrees Centigrade and pressures as high as 44 pounds per square inch absolute. A comprehensive series of tests were performed on cables manufactured to the best commercial practices in order to establish the basic guidelines for control of build configuration as well as each material used in construction of the cable. GRA

N84-21239# Standard Telecommunication Labs. Ltd., Harlow (England). Polymer Processing and Application Dept.
DEVELOPMENT OF FLAME RETARDANT, LOW AGGRESSIVITY CABLES **c33**
J. R. Bury and Brian A. Cranfield *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 193-199 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The construction of a fire retardant, low aggressivity cable may, depending upon the severity of application, require four components based on polymer insulation, fire barrier tape, bedding and sheath. A number of high performance polymers have been evaluated as insulation materials, whilst STC have developed a range of bedding and sheathing materials, both thermoplastic and crosslinkable, to meet the exacting requirements of industrial and military users. Author (GRA)

N84-21240# Standard Telefon og Kabelfabrik A/S, Oslo (Norway). Power Cable Div.
LOW-SMOKE, HALOGENFREE SHIP-OFFSHORE/ONSHORE CABLES WITH IMPROVED FLAME RETARDANCE AND FIRE RESISTANCE **c33**
J. R. Pedersen, T. A. Holte, and E. Johansen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 200-205 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Cables with improved fire resistance and flame retardance have been developed. They will continue to function at least 3 hours even at temperatures up to 1000 C and do not propagate fire when tested according to IEC 332 part 3 1982, category A. Made with halogenfree materials they give off no corrosive gases and very little visible smoke in cases of fire. Cables are made for power, signal and instrument installations in hospitals, high rise buildings, railroad cars, subways, on board ship, oil rigs and oil production platforms. The offshore cables are specially constructed to withstand the rugged climatic conditions in the North Sea area.
Author (GRA)

N84-21241# Minnesota Mining and Mfg. Co., St. Paul. TelComm Products Lab.
VERSATILE FIRE BARRIER SYSTEMS FOR TELEPHONE CABLE **c31**
Roger H. Keith, Douglas G. Dahms, and Richard R. Licht *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 206-214 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

Fire barriers prevent smoke and fire spread along and between cables, through walls and floors, and protect critical conductors and equipment from heat. New flexible intrumescent materials expand up to 10 times when heated, are versatile and easy to install in sealing fire rated floor and wall penetrations. Telephone cables have large insulator/metal ratios and may have slack or oval jacketing, making older limited expansion materials ineffective. Strict design for specific cables and cable densities is obsoleted; reactive foaming chemicals are not needed for an effective seal. Fire expanding hydrated silicate particles are incorporated in a neoprene matrix yielding environmental protection for tough, flexible board, sheet, tape, caulk, putty, and foam rubber products. Penetration kits from these materials have been underwriter tested. Their UL ratings are compared with rubber blocks, foaming resins, and compressed washer devices. Traditional telecraft skills and tools install and adapt the new material to many cable types. Ease, simplicity, speed, and sureness of installation entry, and reentry/reseal are related to the fire hazard window of cable, fiber, or coax additions. Author (GRA)

N84-21242# Thomson-CSF, Conflans-Sainte-Honorine (France). L.T.T. Cable Div.
CYLINDRICAL V-GROOVED NON-METALLIC OPTICAL FIBRE CABLE **c33**
Michel deVecchis, J. P. Demey, Jean Pierre Hulin, J. Personne, and J. C. Staath *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 215-219 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The manufacturing process of a non metallic cylindrical grooved (for slotted core) cable is described. The results obtained show that the behavior of the cable is basically the same as one using metallic strength member with an even better temperature stability. Testing methods used for the cables are presented particularly concerning temperature stability and elongation tests. The results on cable production are given, showing the high quality level of this new cable. Author (GRA)

N84-21243# Kokusai Denshin Denwa Co. Ltd., Tokyo (Japan).
DESIGN AND TEST RESULTS OF OPTICAL FIBER UNITS FOR OPTICAL SUBMARINE CABLE **c33**
Hitoshi Yamamoto, Kihoyumi Mochizuki, Yoshinori Namihira, and Yasuhiko Niiro *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 220-227 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

This paper describes the design and test results of two types of optical submarine cables. One is an embedded-silicone-rubber type optical fiber unit. The optical loss chance is very small under various test conditions as microbending is hard to occur in this fiber unit. For example, the temperature coefficient was about 0.2 mdB/km/C. The manufacturing results of 30 km continuous length of this type unit are also described. The other fiber unit has a strain relaxing effect as each fiber is surrounded with an extremely soft silicone gel and a hard nylon jacket, and these six fibers are stranded. The strain relaxing effect will contribute toward reducing the required screening level of optical fibers used in optical submarine cables. About 0.2% strain relaxing effect was obtained in our experimentally manufactured optical fiber unit. It will be expected that the required screening level will be reduced about 0.6%. Author (GRA)

N84-21244# Centre National d'Etudes des Telecommunications, Lannion (France). Optical Fibre and Cable Dept.
METAL-FREE CYLINDRICAL V-GROOVED OPTICAL CABLE **c33**
Georges LeNoane, Christian Audoux (Silec), Philippe Cheron (Silec), and Bernard Missout (Sat-Direction Technique Cable) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 228-235 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The V-grooved cylindrical optical cable design is particularly suitable to obtain very low loss optical cables. From experience of this structure, metal-free optical cables have been manufactured. After a brief description of the V-grooved cylindrical structure, non metallic materials which can be used as reinforcement are described. Composition, mechanical and optical properties of metal-free V-grooved cylindrical cables are given. Author (GRA)

N84-21245# Valtec, West Boylston, Mass. Cable Engineering Dept.
DESIGN, FABRICATION AND TESTING OF A RUGGEDIZED FIBEROPTIC CABLE **c33**
Harvey L. Blumsack, Paul J. Dobson, Dan Hurwitz, and Ishwar D. Aggarwal *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 236-242 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

This paper presents the design and manufacture of a small size, lightweight, all dielectric cable suitable for easy deployment and recovery in cross-country terrain. Intended as the data and communication link between a battlefield radio station and a jeep-mounted radio system, the cable is composed of two optical fibers twisted together, around which are applied two contrahelically wound layers of Kevlar yarns, an inner jacket, two more contrahelical layers of Kevlar yarns, followed by an outer jacket.
Author (GRA)

N84-21246# Bell Telephone Labs., Inc., Norcross, Ga.
A RODENT AND LIGHTNING PROTECTIVE SHEATH FOR FIBER OPTIC CABLES **c33**
William C. L. Weinraub, Donald D. Davis, and Michael D. Kinard (Western Electric) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 243-249 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

A new protective sheath design for fiber optic cables has been developed. It features corrugated and longitudinally applied metal members with a plastic jacket in an adhesively bonded construction. The use of conventional corrugation tools and longitudinal application in a single pass results in low cost and high line speeds. Tests have shown this sheath to be rodent proof, to have exceptionally high lightning-withstand capability, and in general, to be very rugged mechanically, without compromising cable handling qualities or optical performance. This design is used as a protective oversheath for stranded core cables. It is recommended for buried and aerial applications, particularly where rodent and lightning resistance is essential. It is also recommended as a general mechanical protection and in buried submarine application. Author (GRA)

N84-21247# British Telecommunications Research Ltd., Martlesham Heath (England).
A RADICALLY NEW APPROACH TO THE INSTALLATION OF OPTICAL FIBRE USING THE VISCOUS FLOW OF AIR **c74**
Stephen A. Cassidy and Michael H. Reeve *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 250-254 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

The small size and weight of optical fibers makes it possible to install them into cable bores using compressed air. Units consisting of several fibers in a small package are drawn into the bores by the viscous flow of the air. These units can be routed through various sizes of pre-installed empty cable without need for fiber joints, as and when they are needed. The distributed nature of the drag force along the fiber length avoids the large end stress associated with traditional cable drawing, particularly on tortuous routes. The empty cable can be made cheaply and installed without due care and the fiber unit would be a standard item to be used in any size of cable. A fiber unit 2.5 mm in diameter containing 10 fibers and weighing 3g/m has been installed into a cable with seven 6 mm bores along a length of 325 m using 40 psi of air pressure. 50 psi was sufficient to install 140 m in an internal route including 16 right angles bends and 15 m of upward vertical length. Author (GRA)

N84-21248# International Business Machines Corp., Research Triangle Park, N.C. Polymers Group.
MATERIAL REQUIREMENTS FOR MULTIMEDIA COMMUNICATIONS CABLE **c33**
G. L. Grune *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 255-267 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

One goal of this study was to list materials currently used for the construction of the multimedia communications cable and consider alternate materials which could be used to improve electrical, physical and chemical properties as well as flammability and toxicity concerns. Also important is the need to address the fifteen to thirty (15-30) year life specification during which the cables must sustain minimum performance criteria. For this requirement to have any meaning, the cable materials must also maintain minimum physical and chemical stability standards during the same fifteen to thirty (15-30) year period. Author (GRA)

N84-21249# International Business Machines Corp., Research Triangle Park, N.C. Transmission Technology Development Dept.
DESIGN OF A TWISTED PAIR CABLE FOR A TOKEN PASSING LOCAL AREA NETWORK **c33**
Paul Abramson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 268-270 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The proposed IBM Local Area Network architecture required a cable consisting of two twisted pairs. The paper describes the design and construction of a cable to meet the required parameters of attenuation, crosswalk and characteristic impedance. The cable which resulted from this design has been characterized from 10 kHz to 20 MHz, and is capable of sustaining both low and high speed data transmission over this entire frequency spectrum. Detailed curves showing the major parameters as a function of

frequency for typical samples are presented. In addition, versions of the cable have been designed to meet UL requirements for both plenum and non-plenum use. Author (GRA)

N84-21250# International Business Machines Corp., Research Triangle Park, N.C.
MEASUREMENT OF THE CHARACTERISTIC IMPEDANCE OF BALANCED TWISTED PAIRS USING SCATTERING PARAMETERS **c33**
R. Benton Hobgood *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 271-276 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The concept of scattering parameters has previously been used to describe the behavior of circuit networks in an effort to predict their behavior under varied external conditions. This paper describes the use of scattering parameters to lump an impedance test setup, including connectors, cables, baluns, and even internal test equipment circuitry into one two-port network. Scattering parameters are then derived to describe the behavior of that network at one port as a function of varying loads that may be connected at the other port. After the network is characterized, the cable impedance is calculated from corrected short and open circuited cable impedance measurements. The basic theory of scattering parameters and their application to this procedure are described, and equations are presented which are used to implement this method. A brief description of a computer program that was written to accomplish this procedure is included. Sample plots of the impedance of balanced cables which have been produced by the program are also presented. Author (GRA)

N84-21251# Siecor Corp., Hickory, N.C. Research and Development Group.
DESIGN/PROCESS OPTIMIZATION OF PAIRED COMPUTER INTERCONNECTING CABLE FOR LOCAL AREA NETWORKS **c33**
Edwin D. Laing *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 277-280 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

This paper describes a particular cable design which provides the required high frequency transmission properties and at the same time, yields significantly enhanced near-end crosstalk performance properties. The technique for fabricating this cable is simple yet effective and results in improved production efficiencies when compared to more conventional processes used in the manufacture of such cables. Author (GRA)

N84-21252# Anaconda-Ericsson, Inc., Overland Park, Kans. Electrical Engineering Lab.
EVALUATION OF FOAM-SKIN CABLES FOR AERIAL APPLICATIONS **c33**
Gene R. Samuelson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 281-286 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Since the introduction of foam-skin filled cables, there has been considerable discussion within the industry, both pro and con, regarding the acceptability of foam-skin filled cables for aerial application. This paper reports on results obtained from a study undertaken to evaluate the changes in transmission properties of such cables in a simulated aerial environment. Cable samples produced by six cable manufacturers using conventional, high-temperature drip-resistant filling compounds with a petrolatum base were subjected to temperature cycling from -40 F to 140 F. Transmission parameters were measured at 1, 150 and 772 kHz and compared to initial values. A solid polypropylene insulated filled cable was included for reference. The results show that foam-skin petrolatum based filled cables exhibit stable electrical characteristics when exposed to cycled temperature extremes. Author (GRA)

N84-21253# BICC Telecommunication Cables Ltd., Prescot (England). Systems Engineering Dept.
A PRACTICAL SINGLE-MODE SYSTEM, 50 km AT 140 MBIT/S **c60**
M. J. Gibson, P. Morris (Plessey), and A. Carter (Plessey) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 287-293 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/2

This paper gives details of a fully engineering single-mode optical fiber system between Liverpool and Preston, England. Author (GRA)

N84-21254# Sumitomo Electric Industries Ltd., Yokohama (Japan).
PERFORMANCE CHARACTERISTICS OF VAD SINGLE MODE FIBERS IN MASS PRODUCTION BASIS **c27**
Hisao Seto, Hiroo Kanamori, Naoki Yoshioka, Michihisa Kyoto, Masayuki Nishimura, Shuzo Suzuki, Minoru Watanabe, Shuji Kato, and Toru Kuwahara *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 294-300 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 11/5

The results of investigations on the VAD single mode fibers, fabricated in mass production basis, are presented. In performance characteristics of the VAD single mode fibers operated at 1.3 micron, the low transmission loss could be achieved by improvements on the VAD process and dehydration process. The median and minimum of the transmission losses of the single mode fibers were 0.42 dB/km and 0.32 dB/km at 1.3 micron, respectively. Satisfactory properties were also obtained for the other characteristics, cut-off wavelength, spot size, dispersion, and fiber geometrical parameters. These results are chiefly attributed to the successful developments of the high reproducibility of the VAD preforms with a sufficient longitudinal uniformity. The length dependences on transmission characteristics of long-spliced single mode fibers are also discussed, and the additive properties of transmission loss and dispersion are confirmed. Author (GRA)

N84-21255# Siecor Corp., Hickory, N.C.
RECENT DEVELOPMENTS IN MINI-UNIT CABLE **c33**
Derek O. Lawrence and Peter R. Bark *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 301-307 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The Mini-Bundle cable design was introduced two years ago as a high fiber density design. Data was presented on developmental cables and a first installation. Since that time more than 30,000 km of fiber has been cabled using the design. Applications have included duct, aerial and direct buried as well as special designs including underwater. Performance data obtained in the field and in the lab are reported for these cables of various designs. Splicing procedures are addressed. The extension of the design to single mode fibers is described and the versatility is demonstrated by examples of special cables. Author (GRA)

N84-21256# Centre National d'Etudes des Telecommunications, Lannion (France). Optical Fibers and Cables Dept.
MANUFACTURE CABLES WITH LOW LOSSES **c33**
Daniel Boscher, Bernard Nonclercq, Alain LeBoutet, and Bernard Missout (SAT-Direction Technique Cables) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 308-315 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

The use of monomode fibers with losses between 0.3 dB/km and 0.4 dB/km at 1.55 micron has made it necessary to design a cable structure which does not add to the losses of these fibers. The cylindrical V-grooved rod design protects the fiber from any stress and preserves its initial characteristics prior to cabling, even at 1.55 micron. This technology has made it possible to direct efforts towards the installation of 40 kilometer repeaterless links operating at bit rates of approximately 1 Gbit/s. This article first sets out to describe the structure of the 10-fiber cable and its

manufacture. To minimize splice losses, it was decided to manufacture particularly long cable sections (2500 and 5000 meters). The second part of this article is devoted to the installation procedures for the different cable sections comprising a link between two cities in western France. Special pulling techniques were adopted to avoid applying excessive stress on the cables. The on-the-field splicing procedure of this fiber cable featuring the use of a carbon dioxide laser welding technique is then described. Lastly, results of measurements made over this link are presented and analyzed. Author (GRA)

N84-21257# Bell-Northern Research Ltd., Ottawa (Ontario).
A FIELD SPLICING SYSTEM FOR SINGLE-MODE OPTICAL FIBER **c74**
Grant Pacey, Rick Neumann, and Helmut Lukas *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 316-322 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01

This paper discusses a field splicing system for single-mode optical fiber. The system consists of a specialized single-mode fusion splicing set and an optical power monitoring system used to assist in aligning the fibers. The prerequisites for fusion splicing of single-mode fiber are discussed. The fusion equipment and optical power monitoring system are described in detail and their operation is discussed. Finally, the performance of system is reported. Author (GRA)

N84-21258# Valtec, West Boylston, Mass. Cable Research and Development Dept.
OPTICAL AND MECHANICAL PROPERTIES OF SINGLE MODE CABLES AT 1300 nm **c33**
Steven H. Veld, Peter H. Prideaux, Ishwar D. Aggarwal, Dan Hurwitz, and David Roland *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 323-329 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Single-mode fibers were produced by the MCVD process with losses as low as 0.40 dB/km at 1.3 micron. Loose tube cables were made using these fibers without any loss penalty for a temperature range of -30 C to +70 C. The cables made with these single-mode fibers withstood 600 lbs. pulling and 8.75 N-m impact tests. Concatenation of these fibers using elastomeric splices showed an average splice loss of 0.11 dB. Measurement of optical loss and chromatic dispersion on the concatenated links indicated an average end to end loss of 0.54 dB/km and a linear addition of dispersion. Predictions of concatenated dispersion using the ESI parameters of the individual fibers showed excellent agreement with actual measurements. Author (GRA)

N84-21259# Du Pont de Nemours (E. I.) and Co., Wilmington, Del. Polymer Products Dept.
A NEW ENGINEERING APPROACH FOR CABLE IN FIRE SITUATIONS USING HALOGENATED POLYMERS **c33**
James R. Hoover, Albert L. Moran, Gerry C. Sweet, David B. Allen, Joseph G. DiPinto, Donald H. Lutz, and John O. Punderson *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 330-347 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

All organic materials will burn and give off combustion products. Toxicity and corrosion are not inherent properties of a material; they depend upon the combustability of a material and the conditions and dynamics of a fire. Therefore, those properties which permit moderation or elimination of the fire itself should be identified and controlled. Recently, undifferentiated toxicity and corrosion concerns have developed about halogenated polymers as a generic class. This paper reviews fire science and toxicology consideration affecting materials selection and cable design options. It also examines the merits of performance specifications combined with a hazard analysis and materials engineering approach. The objective is to identify the fire hazards associated with all materials and end products. The methodology ranks the risks as they occur in the fire sequence. The goal is to reduce the risk in the order and the magnitude of the threats imposed by the fire. Author (GRA)

N84-21260# Fujikura Ltd., Sakura (Japan). Optical Fiber and Cable Section.
CHARACTERISTICS OF HEAT AND FLAME RESISTANT OPTICAL FIBER CABLES **c33**
Yoshio Kikuchi, Akio Mogi, Toshiaki Kobayashi, Nobuyuki Misono, Toshiaki Murayama, and Yasuyuki Sugawara *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 348-353 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

Flame resistant and flame retardant properties of various types of optical cables are investigated. As a result of the tests, the authors conclude that it is not suitable to employ the conventional 3-layer coating construction because of the weakness of thermoplastic resin coated fiber at a high temperature. By adopting the heat resistant fiber-reinforced-plastic jacketing on optical fibers, the authors have succeeded in the development of a flame resistant optical fiber cable. Furthermore this optical cable has the noninductive characteristics due to the nonmetallic construction. The cable is light in weight and small in diameter and still has the sufficient mechanical properties. Therefore, this type of cable is promising as a flame resistant optical cable for uses in severe environments such as high temperature up to 800 C half an hour. Author (GRA)

N84-21261# Naval Ship Research and Development Center, Bethesda, Md.
CABLE FIRE STUDIES USING THE OHIO STATE UNIVERSITY RELEASE RATE APPARATUS **c31**
Walter Pocock and John Geremia (U.S. Naval Academy) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 354-371 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 12/1

The work reported here, carried out under the Navy's Ship Damage Control Program, was part of an evaluation of the Ohio State University release rate apparatus (rra), to determine its suitability for establishing smoke and flammability standards for shipboard cables. As a first step, a study was made of the relationship between four basic parameters and burning and smoke-generation of test cables in the rra. A statistical method was used in designing the test program and analyzing results. Eighteen cable types, made from two sets of materials, were used. The study showed the effect of heat flux on smoke and heat release rates to be pronounced, as expected: of cable diameter, moderate; of the ratio of volume of copper to total cable volume, slight; and of cable spacing, not significant. The study supports the concept that heat and smoke release rate data taken over a range of heat fluxes provide a better basis for predicting relative performance of cables in a real fire than do test methods in which heat flux is not controlled. The statistical method used here is believed to be an excellent procedure for similar studies in the future. Author (GRA)

N84-21262# Bell Telephone Labs., Inc., Norcross, Ga. Lightguide Applications and Systems Group.
CIRCUIT TRANSMISSION INTEGRITY OF PLENUM CABLES IN A DEVELOPING FIRE SCENARIO **c31**
C. John Arroyo and Talmage P. Bursh *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 372-380 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 13/12

This paper presents the preliminary results of a new test program designed to measure the circuit transmission integrity of various cable designs in a fire scenarios. Cables are subjected to a novel yet simple circuit integrity measuring technique, while a localized heat source - simulating the intensity of a developing fire scenario - is applied to the cable. While this investigation only monitored changes in mutual and direct capacitance and capacitance-to-ground, other transmission parameters can be measured as

well. The importance of this new test method is cables can be rapidly tested, analyzed and redesigned to withstand increasing fire intensities. Cables designed to withstand these extreme temperature environments should survive long enough to energize a fire alarm system, provide voice communication to various locations or effect an orderly shutdown of plant, as part of an energy and safety control PBX. Author (GRA)

N84-21263# Nippon Telegraph and Telephone Public Corp., Tokyo (Japan). Engineering Bureau.

LARGE SCALE FIRE TEST OF CABLE INSTALLED IN TUNNELS **c31**

Hiroshi Ishihara, Mitsuhiko Miwa, Kouichi Kuratani, and Jun Sawada *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 381-389 ref (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 13/12

A fire prevention system for telephone exchange offices in the case of tunnel accidents is presented. Cables installed in tunnels have the potential of spreading fire from tunnels to buildings when a fire breaks out. In order to reduce this possibility, the Fire Service law requires that cables installed in tunnels have sufficient fire resistance to prevent them from spreading fire from tunnels to buildings. Fire tests are conducted as the initial task in developing a test method for determining structural details. These tests provide data on the flame propagation characteristics of tunnel cables in a simulated fireproof wall between tunnels and buildings. Fireproof wall design is based on information obtained from field surveys. Newly developed systems have already been introduced in telephone exchange offices, which have required fireproof walls to protect against fire spreading. Author (GRA)

N84-21264# Benjamin/Clarke Associates, Inc., Kensington, Md.

OVERALL FIRE SAFER **c31**

Frederic B. Clarke, III, Irwin A. Benjamin, and Philip J. DiNenno *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 390-398 refs (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 13/12

Small-scale tests for flammability are inadequate to predict fire performance in full-scale fires. Ignition resistance and flame spread measured by existing standard tests must be supplemented if overall cable fire hazard is to be assessed. Additional relevant data are provided by determining material behavior at elevated heat flux levels typical of those expected in room fires. In addition, computer-based room fire models are used to predict the full-scale conditions which cable materials may experience. This information can than be combined to provide a quantitative estimate of the contribution of cable materials to overall fire hazard. Hazard aspects include circuit integrity, structural fire spread, smoke generation and smoke toxicity. Author (GRA)

N84-21265# Stanford Univ., Calif. Dept. of Mechanical Engineering.

FRACTURE MECHANICS EVALUATION OF THE STATIC FATIGUE LIFE OF OPTICAL FIBERS IN BENDING **c74**

Drew V. Nelson and Vernon A. Fentress (Raychem Corp.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 399-406 refs (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 20/6

Methods for predicting the time-dependent strength (static fatigue) of optical fibers using principles of fracture mechanics have been developed over the past few years. Previous fracture mechanics evaluations of optical fibers reported in the literature have generally considered the case of applied uniform tension. In many applications, fibers are in bending. This paper uses stress intensity factors for semi-circular surface flaws in a round bar subjected to tension or bending to generate relations between fiber proof-stress level, applied stress and expected lifetimes. The factors are taken as function of instantaneous crack depth during stress corrosion growth. Application of the results to the design of fiber optic organizer/closures is discussed. Author (GRA)

N84-21266# NKF Kabel B.V., Waddinxveen (Netherlands). Fibre Optics Development Group.

COMPUTERISED OPTICAL FIBRE CHARACTERISATION **c60**

Wim L. S. Mathu *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 407-413 refs (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 09/2

In order to handle large amounts of optical fiber in cable manufacturing a computerized characterization system was developed. With this system a low skilled operator can perform complete fiber characterizations with a cycle time of less than 5 minutes at a low cost level. This paper describes the integral design of the system with a strong emphasis on accuracy, reduction of measurement costs, flexibility and ease of operation in a normal cable manufacturing environment. The system is a capable manufacturing environment. The system is capable of measuring attenuation, bandwidth and effective numerical aperture (choice of 8 wavelengths), length and backscattering of a 12 fiber cable in two consecutive measurement cycles (initial and cut back). Author (GRA)

N84-21267# British Telecommunications Research Ltd., Martlesham Heath (England). Trunk and Junction Engineering Section.

REMOTE-ENDED TIME DOMAIN BANDWIDTH MEASUREMENTS ON INSTALLED REGENERATOR SECTIONS OF MULTIMODE OPTICAL FIBRE CABLE IN THE BRITISH TELECOM NETWORK **c74**

S. Ahmad and B. W. Allen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 414-421 refs (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 20/6

The measurement of bandwidth of multimode optical fiber is an established technique. It has normally been made on drums of fiber in the laboratory and on installed fibers where the distant-ends have been looped. In these cases both ends of the fiber are available at one location. This paper describes a technique developed for making time domain bandwidth measurements when both ends of the fiber are separated, i.e., at two locations as in a telecommunication system. In the UK early systems had regenerator sections of u to 10 km long and 30 dB optical loss. The method described enables easy synchronization of the transmitter and receiver of the measurement system over these sections. A comparison of results obtained for fiber on drum when tested with ends adjacent and when simulating ends remote is discussed. Measurements made on part of the British Telecom network of installed optical fiber cables are described and the uncertainties involved in these measurements are discussed. Author (GRA)

N84-21268# Sumitomo Electric Industries Ltd., Yokohama (Japan). Future Wiring Harness Project Group.

DEVELOPMENT OF SHORT-DISTANCE OPTICAL TRANSMISSION CORD **c74**

Masao Yuto, Kyozo Hayashi, Hiroaki Mukunashi, and Satoru Iguchi *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 422-428 ref (For primary document see N84-21212 11-70)

Avail: NTIS HC A20/MF A01 CSCL 20/6

Two types of optical fiber cords designed for short-distance optical transmission are described. One of them uses plastic fiber as its core material. Its thermal resistance, solvent resistance, and mechanical properties are improved by coating it with a special resin sheathing. The other type is an improved version of the plastic clad silica fiber, in which the protrusion of the core at the ends of the cord has been minimized by selecting the optimal cladding material. Either type is characterized by its large core diameter and high numerical aperture. The ease with which cord ends, including connector attachments can be treated affords them broad applicability as short-distance optical links. Author (GRA)

N84-21269# Aktieselskabet Nordiske Kabel- Og Traadfabriker, Copenhagen (Denmark). Research and Development Dept.

THERMAL PROPERTIES OF LOOSE TUBE SECONDARY COATED OPTICAL FIBRES EXPERIMENTALLY DISCUSSED BY

A RELATIVE LIGHT PULSE DELAY TECHNIQUE c74
Hans Damsgard *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 429-435 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

For silicone primary coated optical fibers in loose tubes it is observed that the 150 C wide temperature interval of no excess loss can be much broader than the temperature interval where the fiber is stress free and therefore it is most important to be able to control the latter of these intervals as well. The upper limit of this stress free temperature interval is precisely measured by a new interpretation of the temperature versus light propagation time curve, and for the first time it is reported that this upper limit can be controlled over a wide range in agreement with a simple model of the extrusion process. In addition, dynamical relaxation is observed and one result is a shrinkage as low as 0.35% after 160 hours exposure at 70 C. Loose tube fibers with silicone primary coating and polycarbonate secondary coating show excellent and stable optical and mechanical properties in a large temperature window. Author (GRA)

N84-21270# Phalo Corp., Manchester, N.H. Optical Systems Div.
BREAKOUT CABLES FOR SHORT HAUL FIBER OPTIC SYSTEMS c33
F. T. McDuffee *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 436-444 (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 09/1

A breakout cable construction has been designed consisting of individually strengthened and jacketed optical channels which facilitate use of single channel optical connectors. This cable design eliminates the need for a patch panel, breakout box or cable furcation (which are required for standard cable designs) at the cable to electronics interface. The cable design parameters are reviewed along with a detailed cost comparison between use of standard multi-fiber cable and the new breakout cable in short-haul optical links. Author (GRA)

N84-21271# Army Armament Research and Development Command, Aberdeen Proving Ground, Md. Ballistic Research Lab.
ERROR ANALYSIS OF VAPOR PRESSURE MEASUREMENTS
A. K. R. Celmins Jan. 1984 48 p Supersedes ARBRL-IMR-741 (AF Proj. 1L1-62622-D-554)
(AD-A137584; AD-F300380; ARBRL-TR-02542; ARBRL-IMR-741) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report describes a method for an a posteriori estimation of measurement accuracy simultaneously with the determination of model parameters. The method is applied to vapor pressure measurements for which it determines Antoine parameters and analyzes pressure as well as temperature inaccuracies. Tests of the method on simulated data indicate that for typical vapor pressure data it yields error estimates with reasonable accuracy if more than 50 observations per fitted curve are available. GRA

N84-21272# Los Alamos Scientific Lab., N. Mex.
OBTAINING THE ZERO-TEMPERATURE EQUATION OF STATE FROM SHOCK DATA
B. I. Bennett Jan. 1984 16 p refs
(Contract W-7405-eng-36)
(DE84-006696; LA-9890-MS) Avail: NTIS HC A02/MF A01

The Mie-Gruneisen theory of obtaining the zero-temperature equation of state from experimental shock wave data is reviewed. A study of certain commonly used forms of the Gruneisen parameter is made and the resulting equations of state are presented. These results indicate the limitations on the use of this procedure and suggest improvements for the calibration of pressure measurements in diamond anvil cells. DOE

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see *45 Environment Pollution.*

N84-21273 Stanford Univ., Calif.
MEASUREMENT OF STRESS WITH ACOUSTIC WAVES Ph.D. Thesis
Didier Emmanuel Husson 1983 207 p
Avail: Univ. Microfilms Order No. DA8329725

The velocity of acoustic waves propagating in an elastic medium depends weakly on the state of stress of the medium. This is the acousto-elastic effect. By using perturbation theory and normal mode theory methods the first order phase shift of the acoustic wave due to stress is expressed as the convolution of the components of the stress field with functions depending only on the acoustic displacements in the unstressed medium and the elastic constants of the material. This result is valid for any type of acoustic wave, and nonuniform stress fields. When applied to the case of longitudinal and shear waves propagating in uniformly stressed samples, it reduces to the known expressions for the acousto-elastic effect for plane waves. Author

N84-21274*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ULTRASONIC ANGLE BEAM STANDARD REFLECTOR Patent Application
Robert F. Berry, Jr., inventor (to NASA) Filed 21 Mar. 1984 9 p (NASA-Case-LAR-13153-1; US-Patent-Appl-SN-590921) Avail: NTIS HC A02/MF A01 CSCL 20A

A method that provides an impression profile in a reference standard material utilized in inspecting critically stressed components with pulsed ultrasound was described. A die stamp having an I letter was used to impress the surface of a reference material. The die stamp was placed against the surface and struck with an inertia imparting member to impress the I in the reference standard material. Upset may appear on the surface as a result of the impression and is removed to form a smooth surface. The stamping and upset removal is repeated until the entire surface area of a depth control platform on the die stamp uniformly contacts the material surface. The I impression profile in the reference standard material is utilized for reflecting pulsed ultrasonic beams for inspection purposes. NASA

N84-21275*# Lockheed-Georgia Co., Marietta.
BASIC EXPERIMENTAL STUDY OF THE COUPLING BETWEEN FLOW INSTABILITIES AND INCIDENT SOUND Final Report
K. K. Ahuja Washington NASA Mar. 1984 101 p refs
(Contract NAS3-23286)
(NASA-CR-3789; NAS 1.26:3789; LG83ER0137) Avail: NTIS HC A06/MF A01 CSCL 20A

Whether a solid trailing edge is required to produce efficient coupling between sound and instability waves in a shear layer was investigated. The differences found in the literature on the theoretical notions about receptivity, and a need to resolve them by way of well-planned experiments are discussed. Instability waves in the shear layer of a subsonic jet, excited by a point sound source located external to the jet, were first visualized using an ensemble averaging technique. Various means were adopted to shield the sound reaching the nozzle lip. It was found that the low frequency sound couples more efficiently at distances downstream of the nozzle. To substantiate the findings further, a supersonic screeching jet was tested such that it passed through a small opening in a baffle placed parallel to the exit plane. The measured feedback or screech frequencies and also the excited flow disturbances changed drastically on traversing the baffle axially thus providing a strong indication that a trailing edge is not necessary for efficient coupling between sound and flow. A.R.H.

N84-21276*# Old Dominion Univ., Norfolk, Va. Dept. of Chemical Sciences.
ANALYSIS OF FLOW DYNAMICS THROUGH SMALL DIAMETER GAS SAMPLING SYSTEMS Final Report, 1 Jul. 1983 - 1 Jan. 1984

Kenneth G. Brown Feb. 1984 19 p refs
(Contract NAS1-17099)
(NASA-CR-175447; NAS 1.26:175447) Avail: NTIS HC A02/MF A01 CSCL 20A

The removal of gas material through a capillary opening in a surface is analyzed. The gas, from which the sample is removed, is moving past the surface at supersonic velocities. A variety of possible conditions of temperature, pressure and composition are discussed in an effort to emulate conditions that might be found at the surface of a vehicle traversing the altitude range 100-50 km, or might exist at the surface of a model in the stream of a high enthalpy wind tunnel. Aspects discussed include: (1) the throughput of the capillary for conditions of different lengths and different L/a (length/radius) ratios; (2) the total throughput when the surface in question contains many hundreds of these capillaries; (3) the effect of the capillaries upon the composition of the analyzed gas; (4) the effect of the capillary or capillaries upon the gas stream itself; and (5) the implications of the calculations upon the possible implementation of this type of device as an inlet for a mass spectrometer to be developed for analyzing the upper atmosphere. Author

N84-21277*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TEST-ENGINE AND INLET PERFORMANCE OF AN AIRCRAFT USED FOR INVESTIGATING FLIGHT EFFECTS ON FAN NOISE
Robert A. Golub and John S. Preisser Apr. 1984 70 p refs
(NASA-TP-2254; L-15653; NAS 1.60:2254) Avail: NTIS HC A04/MF A01 CSCL 20A

As part of the NASA Flight Effects on Fan Noise Program, a Grumman OV-1B Mohawk aircraft was modified to carry a modified and instrumented Pratt & Whitney JT15D-1 turbofan engine. Onboard flight data, together with simultaneously measured farfield acoustic data, comprise a flight data base to which JT15D-1 static and wind-tunnel data are compared. The overall objective is to improve the ability to use ground-based facilities for the prediction of flight inlet radiated noise. This report describes the hardware and presents performance results for the research engine. Author

N84-21278# John Carroll Univ., Cleveland, Ohio. Dept. of Physics.
STUDIES OF THE PROPAGATION OF ELASTIC WAVES IN FLUIDS AND SOLIDS Final Report, 1 Dec. 1974 - 30 Nov. 1983
E. F. Carome 15 Dec. 1983 17 p
(Contract N00014-75-C-0247)
(AD-A137603) Avail: NTIS HC A02/MF A01 CSCL 20/1

This final report outlines research in physical acoustics performed in the Physics Department of John Carroll University during the period 1 December 1974 to 30 November 1983. The overall goals of this research and the various projects conducted are outlined. The latter included studies of fluids in the vicinity of the critical point; studies of thermal phonon propagation in single crystals; acoustic impulse generation, propagation and scattering studies; and basic research and development work on fiber optic acoustic sensor systems. Also included in this report are a list of publications resulting from the contract research and a list of graduate students who participated in the program, including the titles of their theses. Author (GRA)

N84-21279# Army Construction Engineering Research Lab., Champaign, Ill.
STRATEGIES FOR AND VALIDITY OF NOISE MONITORING IN THE VICINITY OF CIVILIAN AIRFIELDS AND ARMY INSTALLATIONS Final Report
P. D. Schomer, R. E. DeVor, and R. D. Neathammer Jan. 1984 53 p
(DA Proj. 4A1-62720-A-896)
(AD-A137780; CERL-TR-N-166) Avail: NTIS HC A04/MF A01 CSCL 20/1

It is common practice to use computer-generated noise contours or noise zone maps to assess noise impact and perform noise related land-use planning. However, developers and other interested parties often question the accuracy of computer simulations and suggest direct measurement to verify the computer predictions. This report quantifies the temporal sampling requirements for and the accuracy and ability of directly measured sampled data to estimate the true yearly day/night average sound level (DNL). The results for civilian airports show that a precision (95 percent confidence) of + or - 2 to + or - 3 decibels (dB) is generally achieved with 4 to 8 weeks of monitoring; 1 week from each eighth or 1 week from each quarter of the year, respectively. It does not appear possible to directly monitor blast noise with current instrumentation and techniques, even if the monitoring is done continuously for an entire year. Separating blast noise from other noise and incorporating a single-event threshold appear to be two of the main technological problems. Improved wind screens and multiple microphone arrays may alleviate these problems. GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N84-21280# Naval Postgraduate School, Monterey, Calif.
CERENKOV RADIATION FROM BUNCHED ELECTRON BEAMS, REVISED Technical Report
F. R. Buskirk and John R. Neighbours Apr. 1983 42 p
(F68-342)
(AD-A137533; AD-E301319; NPS-61-83-003-REV) Avail: NTIS HC A03/MF A01 CSCL 20/8

Cerenkov radiation is calculated for electron beams which exceed the velocity of radiation in a non dispersive dielectric medium. The electron beam is assumed to be bunched as emitted from a travelling wave accelerator, and the emission region is assumed to be finite. Predictions include: emission at harmonics of the bunch rate; coherence of radiation at low frequencies; smearing of the emission angle for finite emission regions; and explicit evaluation of power spectrum in terms of bunch dimensions. The results apply to microwave emission from fast electrons in air or other dielectrics. Author (GRA)

N84-21281# Naval Postgraduate School, Monterey, Calif. Dept. of Physics.
DIFFRACTION EFFECTS IN CERENKOV RADIATION Technical Report
John R. Neighbours and Fred R. Buskirk Jun. 1983 33 p
(F68-342)
(AD-A137540; AD-E301319; NPS-61-83-010) Avail: NTIS HC A03/MF A01 CSCL 20/8

Previous work has shown that microwave Cerenkov radiation from periodic electron bunches occurs at harmonics of the bunch frequency and that the radiation is not necessarily confined to a narrow region centered about the expected Cerenkov angle. This report continues the investigation of the spreading of the radiation and presents the results of numerical calculations of the radiated power per unit solid angle and the total radiated power for physically realizable conditions. GRA

N84-21282# Naval Research Lab., Washington, D. C. Plasma Theory Branch.
PLASMA CURRENT AND CONDUCTIVITY EFFECTS ON HOSE INSTABILITY Interim Report
M. Lampe, W. Sharp (Science Applications, Inc., McLean, Va.), and R. Hubbard (JAYCOR, Inc., Alexandria, Va.) 26 Jan. 1984 61 p
(ARPA Order 4395)
(AD-A137549; NRL-MR-5140) Avail: NTIS HC A04/MF A01 CSCL 20/8

Hose instability dispersion relations are derived for a relativistic beam propagating in weakly ionized gas, which include a self-consistent treatment of the spatial and temporal evolution of plasma conductivity and plasma current. In some regimes the results are

dramatically different from these found previously for a beam propagating in a fixed conductivity channel. For example, the hose growth rate is found to decrease with increasing beam I sub b, for a beam propagating in initially neutral gas, even though the plasma return current fraction increases rapidly with I sub b. As another example, it is found that an externally driven discharge current can completely eliminate hose instability in a fixed conductivity channel, but causes only a weak decrease in growth rate when the plasma conductivity is modeled self-consistently.
Author (GRA)

N84-21283# California Univ., Los Angeles. Dept. of Chemistry and Biochemistry.
RATES AND MECHANISMS OF ENERGY DISSIPATION AND THE STRUCTURE OF MOLECULAR SOLIDS Final Report, 1 Jan. 1975 - 31 Mar. 1983
M. A. El-Sayed 31 Jan. 1984 26 p
(Contract N00014-75-C-0602)
(AD-A137714) Avail: NTIS HC A03/MF A01 CSCL 07/4

The research carried out covered a number of research areas. The use of spins of the lowest triplet state was studied as a probe of intramolecular intersystem energy transfer in molecules. The interplay between singlet and triplet of different electronic nature was quantitatively examined (publications 1-5, 8 and 13). Nonradiative processes in the gas phase and in solution were studied in publications 7,10,11 and 14. Spectral diffusion studies due to intermolecular energy transfer in solids were made for both spin transitions (publications 15 and 16), electronic transitions of rare earth ions in glasses (publications 6,17,18 and 20) and singlet-triplet electronic transitions in orientationally disordered solids (publications 19, 21-23). In all these studies, the mechanisms of the energy transfer processes involved are investigated in terms of the interaction coupling involved. GRA

N84-21284# Pittsburgh Univ., Pa. Dept. of Chemistry.
SPECTROSCOPIC STUDIES OF THE PRODUCTS OF THE REACTIONS OF EXCITED NOBLE-GAS ATOMS Final Scientific Report, 15 Mar. 1979 - 14 May 1983
Michael F. Golde 29 Jun. 1983 56 p
(Grant AF-AFOSR-0089-79; AF Proj. 2303)
(AD-A137750; PR81-00815; AFOSR-84-0064TR) Avail: NTIS HC A04/MF A01 CSCL 07/4

The products of the very rapid reactions of electronically-excited Ar, Kr and Xe atoms with several oxygen-, hydrogen- and halogen-containing compounds have been investigated using the saturation ion-current technique and emission and atomic resonance fluorescence spectroscopy in discharge-flow systems. New insight has been obtained into the mechanisms of the channels leading to chemiionization and noble-gas halide formation. Energy transfer leading to molecular dissociation is the major and often the dominant channel, with one or more atoms being eliminated in strong preference to elimination of molecular or electronically-excited fragments. For the excited noble gas atoms, the high quenching efficiency and dominance of dissociation and ionization channels are associated with the availability of accessible acceptor states of the quenching molecule, as revealed by its absorption spectrum. It is proposed that these efficient reactions occur by energy transfer at relatively long range with no major prior distortion of the quenching molecule. It is expected that this model should be directly applicable to the reactions of certain other excited species, which exhibit a similar correlation of quenching rate constants with the availability of acceptor states at the appropriate energy. Author (GRA)

N84-21285# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
MICROWAVE EMISSION FROM RELATIVISTIC ELECTRON BEAMS Final Report, 1 Oct. 1982 - 31 Oct. 1983
George Bekefi 23 Dec. 1983 39 p
(Contract F49620-83-C-0008; AF Proj. 2301)
(AD-A137752; AFOSR-84-0027TR) Avail: NTIS HC A03/MF A01 CSCL 20/8

During the past year microwave and millimeter wave emission experiments on three systems were carried out. System one is a Rippled-Field Magnetron and represents a hybrid between a conventional magnetron and a free electron laser. System two is a Circular Free Electron Laser in which a rotating ring of relativistic electrons is subjected to an azimuthally periodic magnetic field. The third system concerns an inverted Relativistic Magnetron.
GRA

N84-21286# Georgetown Univ., Washington, D.C.
[STUDY OF THE EFFECT OF ADSORBED IONS ON THE ELECTROSORPTION OF ORGANIC MOLECULES AND THE KINETICS OF FORMATION OF CONDENSED FILMS] Final Report, Sep. 1980 - Oct. 1983
R. DeLevie 1983 7 p
(Grant AF-AFOSR-0262-80; AF Proj. 2303)
(AD-A137892; AFOSR-84-0092TR) Avail: NTIS HC A02/MF A01 CSCL 07/4

The original objective of this project was, first, to study the effect of adsorbed ions on the electrosorption of organic molecules and vice versa and, secondly, to study the kinetics of formation of condensed films. The first objective was achieved, although the results obtained were rather unexpected; the second objective was met far beyond our original hope, as it proved possible to develop an entirely new approach to the general problem of nucleation and growth. This work is continuing. GRA

N84-21287# Missouri Univ., St. Louis.
LOW ENERGY ION-NEUTRAL COLLISIONS Progress Report, 1 Jun. 1983 - 31 May 1984
J. J. Leventhal Jan. 1984 11 p refs
(Contract DE-AC02-76ER-02718)
(DE84-005392; DOE/ER-02718/11; COO-2718-11) Avail: NTIS HC A02/MF A01

Ion production in vapor irradiated by a pulsed laser was investigated. The production mechanisms were found to be considerably different from those that take place in vapor that is irradiated by CW laser light. In a separate set of experiments collisional excitation was examined; it was found that this process obeys the same selection rules as optical excitation, thus confirming theory. DOE

N84-21288# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ELECTRON MICROSCOPY AT ATOMIC RESOLUTION
R. Gronsky Nov. 1983 28 p refs Presented at the Mater. Res. Soc. Ann. Meeting, Boston, 14-17 Nov. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005546; LBL-16937; CONF-831174-66) Avail: NTIS HC A03/MF A01

The direct imaging of atomic structure in solids which has become increasingly easier to accomplish with modern transmission electron microscopes, many of which have an information retrieval limit near 0.2 nm point resolution is discussed. To achieve better resolution, particularly with any useful range of specimen tilting, a major design effort is required. The new atomic resolution microscope (ARM) is described. Capable of 0.18 nm or better interpretable resolution over a voltage range of 400 kV to 1000 kV with + or - 400 biaxial specimen tilting, the ARM features a number of new electron-optical and microprocessor control designs. The atomic resolution performance demonstrated for a selection of inorganic crystals are highlighted. DOE

N84-21289# Iowa Univ., Iowa City. Dept. of Physics and Astronomy.
CONFIGURATION SPACE FADDEEV CALCULATIONS Progress Report, 1 Jan. - 31 Dec. 1983
Gerald L. Payne, William H. Klink, and Wayne N. Polyzou Jan. 1984 15 p refs
(Contract DE-AC02-81ER-40038)
(DE84-006492; DOE/ER-40038/T1) Avail: NTIS HC A02/MF A01

The nuclear three body problem is used as a tool to test our basic understanding of the nucleon-nucleon interaction. Also,

accurate three body wave functions are used to test various approximations used in nuclear reaction theories. During the past year the computer codes to solve the trinucleon problem with realistic potentials, both for the bound state and the zero energy scattering problem were developed. Noncompact kernel equation is used for three body scattering for energies below the three body breakup energy. The p-d scattering length calculated with realistic interactions showed that the experimental value for the doublet scattering length should be reevaluated. In order to interpret the results of new experiments in terms of quarks exchanging gluons, a framework for constructing models of a baryon with a three quark core and a quark antiquark cloud was constructed. The properties of the interactions which ensure both a well defined scattering theory and a mass spectrum with a finite number of physical baryons were derived. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation.*

No abstracts in this category.

74 OPTICS

Includes light phenomena.

N84-21290*# Perkin-Elmer Corp., Danbury, Conn. Space Science Div.

OPTICAL COATING IN SPACE Final Report

Alan N. Bunner 27 Oct. 1983 83 p refs

(Contract NASw-3753)

(NASA-CR-175441; NAS 1.26:175441; ER-591; Rept-2983-81) Avail: NTIS HC A05/MF A01 CSCL 20F

A technological appraisal of the steps required to approach the goal of in-situ optical coating, cleaning and re-coating the optical elements of a remote telescope in space is reported. Emphasis is placed on the high ultraviolet throughput that a telescope using bare aluminum mirrors would offer. A preliminary design is suggested for an Orbital Coating Laboratory to answer basic technical questions. Author

N84-21291*# National Aeronautics and Space Administration, Washington, D. C.

AUTOMATIC EVALUATION OF INTERFEROGRAMS

Friedhelm Becker Sep. 1982 77 p refs Transl. into ENGLISH of "Zur Automatischen Auswertung von Interferogrammen" rept. Mitteilungen-74, ISSN-0374-1257 Max Planck Inst. fuer Stroemungsforschung, Goettingen, West Germany, 1982 p 1-106 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76953; NAS 1.15:76953; Rept-74; ISSN-0374-1257) Avail: NTIS HC A05/MF A01 CSCL 20F

A system for the evaluation of interference patterns was developed. For digitizing and processing of the interferograms from classical and holographic interferometers a picture analysis system based upon a computer with a television digitizer was installed. Depending on the quality of the interferograms, four different picture enhancement operations may be used: Signal averaging; spatial smoothing, subtraction of the overlayed intensity function and the removal of distortion-patterns using a spatial filtering technique in the frequency spectrum of the interferograms. The extraction of fringe loci from the digitized interferograms is performed by a foating-threshold method. The fringes are numbered using a special scheme after the removal of any fringe disconnections which appeared if there was insufficient contrast in the holograms. The reconstruction of the object function from the fringe field uses least squares approximation with spline fit. Applications are given. Author

N84-21292*# National Aeronautics and Space Administration, Washington, D. C.

POLARIZATION RADIATION IN THE PLANETARY ATMOSPHERE DELIMITED BY A HETEROGENEOUS DIFFUSELY REFLECTING SURFACE

S. A. Strelkov and T. A. Sushkevich Oct. 1983 39 p refs Transl. into ENGLISH of USSR Acad. of Sci., Inst. M. V. Keldysh, Preprint 19 Moscow, 1983 p 1-28 Transl. by Scientific Translation Service, Santa Barbara, Calif.

(Contract NASw-3542)

(NASA-TM-77296; NAS 1.15:77296) Avail: NTIS HC A03/MF A01 CSCL 20F

Spatial frequency characteristics (SFC) and the scattering functions were studied in the two cases of a uniform horizontal layer with absolutely black bottom, and an isolated layer. The mathematical model for these examples describes the horizontal heterogeneities in a light field with regard to radiation polarization in a three dimensional planar atmosphere, delimited by a heterogeneous surface with diffuse reflection. The perturbation method was used to obtain vector transfer equations which correspond to the linear and nonlinear systems of polarization radiation transfer. The boundary value tasks for the vector transfer equation that is a parametric set and one dimensional are satisfied by the SFC of the nonlinear system, and are expressed through the SFC of linear approximation. As a consequence of the developed theory, formulas were obtained for analytical calculation of albedo in solving the task of dissemination of polarization radiation in the planetary atmosphere with uniform Lambert bottom. M.A.C.

N84-21293*# University Space Research Association, Huntsville, Ala.

NASA/MSFC GROUND-BASED DOPPLER LIDAR NOCTURNAL BOUNDARY LAYER EXPERIMENT (NOBLEX)

G. D. Emmitt Apr. 1984 22 p refs

(Contract NAS8-34010)

(NASA-CR-3778; NAS 1.26:3778) Avail: NTIS HC A02/MF A01 CSCL 20F

During the summer of 1982, NASA/MSFC's ground-based CO2 Doppler Lidar Velocimeter (DLV) was deployed at the Denver Stapleton Airport as part of NASA's participation in the JAWS (Joint Airport Weather Studies) program. Configured to measure the radial wind component within a 10 km radius, the conically scanning lidar was used to examine the evolution of a nocturnal boundary layer under the conditions of cloud free skies and rolling terrain. A valley drainage flow was detected and a two dimension flow visualization constructed. The depth of the gravity current was -700 meters while the depth of the creek valley was -150 meters. This deep drainage flow was detectable for distances of 30 to 40 km from the exit region of the valley. Although the sample period (2000 to 2300 CST) was short and only one nocturnal boundary layer case examined, the usefulness of the DLV was demonstrated as well as the care that must be exercised in interpreting lidar data taken in a stable boundary layer in the vicinity of subtle terrain features. Author

N84-21294# Naval Research Lab., Washington, D. C. Transmission Technology Branch.

LINEARIZATION OF AN ANALOG FIBER-OPTIC SYSTEM USING THE QUASI-FEEDFORWARD TECHNIQUE Interim Report

E. L. Althouse and D. M. Kopp 29 Dec. 1983 30 p

(F21-222)

(AD-A137529; AD-E000559; NRL-MR-5232) Avail: NTIS HC A03/MF A01 CSCL 20/6

This report discusses the use of the quasi-feedforward linearization technique for improving the range over which an analog fiber optic system can provide distortionless performance when the optical source is an incoherent device such as an LED. Coherent sources such as a laser are usually dominated by

nonlinear effects, such as modal interaction in the fiber and reflections of light from the fiber back into the laser cavity, that cannot be eliminated by external compensation. The technique of quasi-feedforward linearization focuses upon deriving a predistorted signal from one optical source that causes distortion cancellation when used to drive a second optical source with similar nonlinear characteristics. The predistorted signal is derived by using two feedforward summations. GRA

N84-21295# Naval Air Development Center, Warminster, Pa.
SOLAR-BLIND RAMAN LIDAR, PHASE 2 Progress Report, Sep. 1980 - Aug. 1983
A. Salik Jun. 1983 56 p
(AD-A137604; NADC-83122-30) Avail: NTIS HC A04/MF A01 CSCL 17/5

This document describes the progress of the NADC Atmospheric Lidar Program funded by the Naval Environmental Prediction Research Facility, Monterey, California, under Program Element 62759N, Project F52553. The objective of this effort is to theoretically determine and experimentally verify the ability of a solar-blind lidar system to remotely measure profiles of atmospheric properties critical to naval operations. The properties chosen for investigation are water vapor concentration, temperature and transmission; with the acquisition of water vapor profiles as the primary goal. The theoretical feasibility studies have been thoroughly documented via publication in a professional journal, a technical report and a text on atmospheric water vapor. In addition, experimental results using a KrF excimer laser were presented at the winter 1983 topical meeting of the Optical Society of America. These results are presented in this document. GRA

N84-21296# Air Force Geophysics Lab., Hanscom AFB, Mass. Optical Physics Div.
COCHISE OBSERVATIONS OF ARGON RYDBERG EMISSION FROM 2 TO 16 MICROMETERS Interim Report
W. T. Rawlins (Physical Sciences, Inc., Andover, Mass.), A. Gelb, and R. A. Armstrong 5 Aug. 1983 60 p
(AF Proj. 2310)
(AD-A137916; AFGL-TR-83-0201; AFGL-ERP-849) Avail: NTIS HC A04/MF A01 CSCL 20/6

Infrared (2 to 16 micrometers) emission from atomic Ar Rydberg atoms, excited in a coventional low-pressure microwave discharge plasma, has been observed in the cryogenic COCHISE facility. The observed spectrum is very complex but is identifiable using the detailed energy level structure and optical selection rules for Arl. Detailed transition probabilities for dipole-allowed transitions between 2 and 16 micrometers were estimated using the Coulomb approximation. Comparisons of observed and simulated spectra show that substantial LWIR emission (approx. 12 micrometers) arises from Rydberg states near the ionization limit. These states must have kinetically enchanced populations in order to account for the observed emission intensities. The results are interpreted in terms of a radiative collisional cascade sequence initiated by dissociative recombination of Ar2(+) with energetic electrons in the active discharge. The implications of these observations for atmospheric infrared signatures are discussed. GRA

N84-21297# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
BOUNDARY VALUES OF PARAMETERS AND PERSPECTIVES FOR THE DEVELOPMENT OF SENSORS FOR THERMAL IMAGING EQUIPMENT
Branko Livada 4 Jan. 1984 25 p Transl. into ENGLISH from Vojnotehn. Glasnik (Yugoslavia), v. 31, no. 1, Jan./Feb. 1983 p 37-45
(AD-A137185; FTD-ID(RS)T-1793-83) Avail: NTIS HC A02/MF A01 CSCL 17/8

Individual infrared thermal scanning instruments are surveyed. Advantages and drawbacks of each type of sensor are discussed. It is concluded that it is difficult to make definitive choices among sensors because of the mix of advantages and disadvantages. Most existing technical problems with thermal sensors are viewed as solvable. R.J.F.

N84-21298# Los Alamos Scientific Lab., N. Mex.
CURRENT SENSING IN MAGNETIC FUSION EXPERIMENTS BY FARADAY ROTATION IN SINGLE-MODE OPTICAL FIBERS
G. I. Chandler and F. C. Jahoda 1983 8 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-7405-eng-36)
(DE84-004326; LA-UR-83-3480; CONF-831203-48) Avail: NTIS HC A02/MF A01

Sensors exploiting the Faraday effect in single-mode optical fibers are practical means of measuring large currents in the MFE environment. Work still needs to be done to overcome the effects of linear birefringence. Distortion caused by dynamic stress-induced birefringence were seen and the importance of physically eliminating it because of the difficulty of treating it analytically was shown. DOE

N84-21299# California Univ., Livermore. Lawrence Livermore Lab.
CHEMICAL TREATMENT OF SILICATE GLASSES FOR PRODUCING ANTI-REFLECTION SURFACES
G. Richard Wirtenson, Ian M. Thomas, Norman J. Brown, and John G. Wilder 13 Jan. 1984 4 p refs Presented at the Topical Meeting on Optical Fabrication and Testing, Monterey, Calif., 18-20 Apr. 1984
(Contract W-7405-eng-48)
(DE84-005865; UCRL-90218; CONF-840494-1) Avail: NTIS HC A02/MF A01

Chemical treatments to reduce fresnel reflectance of BK7 and SiO2 for high fluence laser applications in the spectral range 0.25 to 1.06 are described. DOE

N84-21300# Los Alamos Scientific Lab., N. Mex.
NONLINEAR OPTICS: WHERE DO WE GO FROM HERE
Robert A. Fisher 1984 6 p refs Presented at the NSF Workshop on the Future of Lightwave Technol., Los Angeles, 1 Feb. 1984
(Contract W-7405-eng-36)
(DE84-006028; LA-UR-84-339; CONF-840249-1) Avail: NTIS HC A02/MF A01

Nonlinear optics deals with induced polarizations which are not proportional to the input fields. This topic includes the spontaneous scattering of light waves by elementary excitations such as sound waves, plasma waves, heat waves, molecular vibrations (the Raman effect), spin waves, and a host of others; such spontaneous scatterings do not rely on the brightness of the probe light source, and therefore many of these topics were understood well before the invention of the laser. The laser did herald a new age, however. Now materials are exposed to optical intensities exceeding a 10(15) Watts per square centimeter, with pulse durations ranging from femtoseconds (10(-15) seconds) to several hours. Additionally, the spectral bandwidths of the exciting light is made exceedingly narrow and exceedingly directional. Some applications of nonlinear optics are briefly discussed. DOE

N84-21222# Corning Glass Works, N.Y. Waveguide Product Engineering Lab.
FACTORY SPLICING OF OPTICAL WAVEGUIDE FIBER
Donald H. Taylor and Stuart L. Saikkonen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 63-69 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20F

N84-21232# Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.
ANALYSIS OF EXCESS ATTENUATION IN OPTICAL FIBERS SUBJECTED TO LOW TEMPERATURES
Powers Garmon *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 134-143 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21233# Bell Telephone Labs., Inc., Murray Hill, N. J. Plastics Applied Research, Properties and Processing Group.

BUCKLING OF OPTICAL FIBERS WITHIN ELASTOMERS USED IN AN EMBEDDED-CORE CABLE STRUCTURE
Lee L. Blyler, Jr., Czeslaw Gieniewski, Xina Quan, and Hany Ghoneim *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 144-150 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21247# British Telecommunications Research Ltd., Martlesham Heath (England).
A RADICALLY NEW APPROACH TO THE INSTALLATION OF OPTICAL FIBRE USING THE VISCOUS FLOW OF AIR
Stephen A. Cassidy and Michael H. Reeve *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 250-254 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21257# Bell-Northern Research Ltd., Ottawa (Ontario).
A FIELD SPLICING SYSTEM FOR SINGLE-MODE OPTICAL FIBER
Grant Pacey, Rick Neumann, and Helmut Lukas *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 316-322 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01

N84-21265# Stanford Univ., Calif. Dept. of Mechanical Engineering.
FRACTURE MECHANICS EVALUATION OF THE STATIC FATIGUE LIFE OF OPTICAL FIBERS IN BENDING
Drew V. Nelson and Vernon A. Fentress (Raychem Corp.) *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 399-406 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21267# British Telecommunications Research Ltd., Martlesham Heath (England). Trunk and Junction Engineering Section.
REMOTE-ENDED TIME DOMAIN BANDWIDTH MEASUREMENTS ON INSTAL'.ED REGENERATOR SECTIONS OF MULTIMODE OPTICAL FIBRE CABLE IN THE BRITISH TELECOM NETWORK
S. Ahmad and B. W. Allen *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 414-421 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21268# Sumitomo Electric Industries Ltd., Yokohama (Japan). Future Wiring Harness Project Group.
DEVELOPMENT OF SHORT-DISTANCE OPTICAL TRANSMISSION CORD
Masao Yuto, Kyozo Hayashi, Hiroaki Mukunashi, and Satoru Iguchi *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 422-428 ref (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

N84-21269# Aktieselskabet Nordiske Kabel- Og Traadfabriker, Copenhagen (Denmark). Research and Development Dept.
THERMAL PROPERTIES OF LOOSE TUBE SECONDARY COATED OPTICAL FIBRES EXPERIMENTALLY DISCUSSED BY A RELATIVE LIGHT PULSE DELAY TECHNIQUE
Hans Damsgard *In* Army Commun.-Electron. Command Proc. of the 32nd Intern. Wire and Cable Symp. 1983 p 429-435 refs (For primary document see N84-21212 11-70)
Avail: NTIS HC A20/MF A01 CSCL 20/6

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N84-21301# Academy of Sciences (USSR), Moscow. Space Research Inst.
GAMMA RAY LINE EMISSION, NUCLEAR DESTRUCTION AND NEUTRON PRODUCTION IN HOT ASTROPHYSICAL PLASMAS. DEUTERIUM BOILER AS A GAMMA RAY SOURCE
F. A. Aharonian and R. A. Sunyaev 1983 48 p refs
(Rept-762) Copyright. Avail: Issuing Activity

In the hot astrophysical plasmas with the ion temperature high enough for nuclear excitation (> or = 10 to the 11th power K) at a higher or the same rate proceed inelastic spallation reactions, leading to nuclei destruction during the stationary high temperature plasma formation time. Therefore the nuclei manage to be excited before destruction, on the average not more than once. As a result the nuclear gamma ray line luminosity is strongly depressed and doesn't exceed the .001 to .0001 fraction of the total luminosity associated mainly with electron component of plasma. In the quasistationary sources of hard radiation (e.g., accretion disks) due to nuclear destruction a proton-neutron plasma is formed without a noticeable content of heavy nuclei. The possibility of neutron evaporation from the two temperature accretion disks is discussed. Author

N84-21302# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ENHANCEMENT OF THE EXCITATION AND DEEXCITATION RATE COEFFICIENT OF IONS IN DENSE PLASMAS: THE ROLE OF AUTOIONIZING STATES
Takashi Fujimoto and Takako Kato Dec. 1983 27 p refs
(IPPJ-661) Avail: NTIS HC A03/MF A01

Properties of atoms and ions immersed in a dense plasma were studied in relation to the inertial confinement fusion research. The effects of dense surroundings on the atomic transition oscillator strength and the excitation cross section of ions were calculated by various approximations; these quantities tend to decrease with an increase in the plasma density owing to the Debye screening. A new excitation process, i.e., the dielectronic-capture-ladder-like (DL) excitation involving autoionizing states as intermediate states was proposed. A detailed calculation on the DL excitation and deexcitation is presented. An approximate treatment of the problem gives insight into the physical picture of the process. The validity range and other relevant parameters are discussed. B.G.

N84-21303# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ANNUAL REVIEW, APRIL 1982 - MARCH 1983 Annual Review, Apr. 1982 - Mar. 1983
1983 225 p refs
(ISSN-0547-1567) Avail: NTIS HC A10/MF A01

The objectives of the reacting plasma project (R-Project) are to study the physical phenomena which are observed in a nuclear fusion reacting plasma and to establish basic technologies for achieving a D-T reaction plasma with high reliability and safety. In order to produce the D-T reacting plasma and carry out physics experiments, the following conditions should be satisfied: (1) high ion temperature, (2) high plasma density, and (3) high plasma current to confine alpha particles produced. These requirements met by constructing a Tokamak with a strong toroidal magnetic field and by providing a high power heating system. Author

N84-21304# Nagoya Univ. (Japan). Inst. of Plasma Physics.
CONCEPTUAL DESIGN OF THE RFC REACTOR
R. Kumazawa, K. Adati, T. Hatori, M. Ichimura, H. Obayashi, S. Okamura, T. Sato, T. Watari, and G. A. Emmert Dec. 1982 24 p refs
(IPPJ-659) Avail: NTIS HC A02/MF A01

A parametric analysis and a preliminary conceptual design for the RFC reactor (including cusp field) with and without alpha particle heating are described. Steady state operation can be obtained for

various RF ponderomotive potentials in the case of alpha particle heating. Author

N84-21305# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ION BERNSTEIN WAVE HEATING EXPERIMENT ON JIPPT-II-U DEVICE
M. Ono, T. Watari, R. Ando, J. Fujita, Y. Hirokura, K. Ida, E. Kako, K. Kawahata, Y. Kawasumi, and K. Matsuoka Jan. 1984 18 p refs
(IPPJ-662) Avail: NTIS HC A02/MF A01

Ion Bernstein wave heating is investigated in the JIPPT-II-U Tokamak plasma BAR-N(o) approx = 1.5 x 10(13)/cu cm, T(eo) approx = 700 eV, and T(io) = 300 eV for P(RF) approx < 100 BAR-N(o) appox = kW. In a two ion species helium hydrogen plasma, the third harmonics of helium minority cyclotron resonance (deuterium like) is heated. The background hydrogen ion temperature monitored by charge exchange shows a significant rise, Delta T(i) approx < 600 eV, when the helium harmonic resonance layer is placed near the center of the plasma. Typical observed hydrogen ion heating quality factor, Delta T(i)/P(RF)/BAR-N(o) is approx < 10 eV/kW/10(13)/cu cm. The dependence of ion heating efficiency on RF power, magnetic field and ion concentration is presented. M.G.

N84-21306# Nagoya Univ. (Japan). Inst. of Plasma Physics.
COMPACT TOROIDS WITH ROTATING HALO-THE SPINTOR
Kazunari Ikuta Nov. 1983 14 p refs
(IPPJ-658) Avail: NTIS HC A02/MF A01

Plasma stability and equilibrium in a type of compact toroid spinning about its axis of symmetry (spintor) is addressed with particular attention given to tilting mode instability. The way of introducing the spinning motion about the axis of the symmetry of the configuration was considered. The generation of an ambipolar field in the halo of the spintor is a possible candidate in order to give a toroid a spin. In this case the halo is also rotating about the axis of the symmetry. The problem of energy removal from the toroidal plasma is absent in the spintor, since each end is open for treatments and the area of the end plates is easily expanded. M.A.C.

N84-21307# Nagoya Univ. (Japan). Inst. of Plasma Physics.
TRANSPORT OF A MULTIPLE-ION SPECIES PLASMA IN THE COLLISIONLESS REGIME IN A BUMPY TORUS
D. E. Hastings (ORNL) Nov. 1983 29 p refs
(IPPJ-657) Avail: NTIS HC A03/MF A01

The ion neoclassical transport coefficient in a multiple ion species plasma in a bumpy torus are calculated in the low collisionality regime. The poloidal electric field is calculated self consistently with collisional electrons. Both pitch angle and energy scattering are included in the collision operator. M.G.

N84-21308# Nagoya Univ. (Japan). Inst. of Plasma Physics.
THE KINETIC EQUATION IN AN IMPERFECT IONIZED PLASMA
Yoshikazu Yoshida (Technical Coll., Iwate, Japan) Nov. 1983 29 p refs
(IPPJ-656) Avail: NTIS HC A03/MF A01

The kinetic equation of an imperfect ionized plasma is derived from the Boltzmann equation which has the Fokker-Planck, elastic and inelastic collision terms. Inelastic processes such as the excitation, ionization, dissociation and absorption processes are correctly treated in this model. It consists of kinetic equations of plural molecules and each component interacts through the integrated collision term respectively. Some relaxation times are calculated by the second order of the mean drift velocity. M.G.

N84-21309# Nagoya Univ. (Japan). Inst. of Plasma Physics.
BOUNCE RESONANCE HEATING AND RADIAL TRANSPORT OF ELECTRONS IN MAGNETIC MIRRORS
K. Sato (Himeji Inst. of Technol., Japan) and Tadatsugu Hatori Nov. 1983 42 p refs
(IPPJ-654) Avail: NTIS HC A03/MF A01

Power transfer from the DCLC or the AIC instability mode to electrons and associated radial transport are calculated based upon a bounce-averaged quasilinear theory. The heating mechanism is the electron bounce resonance with the waves in the ion cyclotron frequency range. The analysis includes axial variations of the ambipolar potential and the magnetic field strength. Application of the analysis to the 2XIIB and tandem mirror (TMX) experiments shows that the power transfer from the DCLC is much smaller than the electron-drag power, but that from the AIC can be comparable with it. Furthermore, the radial transport induced by the DCLC or the AIC mode can be larger than the classical end-loss. M.G.

N84-21310# Nagoya Univ. (Japan). Inst. of Plasma Physics.
PROCEEDINGS ON SYMPOSIUM ON ATOMIC COLLISION DATA FOR DIAGNOSTICS AND MODELLING OF FUSION PLASMAS
Hiroyuki Tawara, ed. Dec. 1983 242 p refs Sypm. held in Nagoya, Japan, 29-30 Aug. 1983 Submitted for publication Sponsored in part by the Ministry of Education, Science and Culture
(IPPJ-AM-33) Avail: NTIS HC A11/MF A01

The role of atomic processes and their data in fusion plasma diagnostics and modeling is addressed. High temperature plasmas in both Tokamak and inertial confinement devices are discussed. The diagnostic methods covered include beam probe and various spectroscopic techniques. For individual titles, see N84-21311 through N84-21328.

N84-21311# Japan Atomic Energy Research Inst., Tokai. Div. of Thermonuclear Fusion Research.
ATOMIC PROCESSES FOR PLASMA DIAGNOSTICS IN TOKAMAKS
Satoshi Kasai *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 1-14 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Transport phenomena of metal impurities in neutral beam heated plasmas (JFT-2) and in ohmically heated plasmas (ISX-B) are analyzed. It is shown that the ion temperature in the plasma center can be estimated from spectroscopic measurements by observing the forbidden-lines of highly ionized ions. Spectroscopic observations of charge transfer processes in ISX-B plasmas during neutral beam heating and their application to determination of the density of fully ionized oxygen are discussed. All these results indicate requirements of accurate calculations and measurements of rate coefficients for ionization, recombination (radiative, dielectronic and charge transfer), and excitation in order to understand plasma properties in high temperature Tokamaks. M.G.

N84-21312# Nagoya Univ. (Japan). Inst. of Plasma Physics.
IMPURITY TRANSPORT IN TOKAMAKS
Tsuneo Amano *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Theoretical and experimental efforts directed towards gaining an understanding of impurity behavior in Tokamaks are reviewed. In the Alcator Tokamak experiments, a laser blow-off technique was used to introduce trace amounts of impurities into ohmically heated plasmas. After a series of experiments in which they injected Si, Al, Fe, Mo impurities, an equation representing empirical impurity confinement time was derived. The scaling of this equation was compared with the results of impurity injection experiments on other Tokamaks, FT-I, PDX, TFR, ISX-B. Impurity confinement times in all these cases agree remarkably well, except for the TFR confinement times, which were about a factor of two larger than predicted. In the presence of intense neutral beam injection impurity ions behave differently. Specifically, in the ISX-B experiments, a marked accumulation of impurity ions toward the center of the plasma was observed in the case of counter neutral beam injection. This was interpreted semi-quantitatively by the neoclassical effect of the rotation of the plasma driven by the neutral beam. M.G.

N84-21313# Japan Atomic Energy Research Inst., Ibaraki.
NUMERICAL ANALYSES FOR SCRAPE-OFF PLASMAS IN FER DIVERTOR CHAMBER
Masayoshi Sugihara, Seiji Saito (Hitachi Energy Research Lab.), and Noboru Fujisawa *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 19-40 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

The possibilities of attaining the high density operation in the Fusion Experimental Reactors (FER) divertor are investigated using a self-consistent treatment for the scrape-off plasma and neutrals. The scrape-off plasmas are described by the fluid equations consisting of the particle, momentum and energy conservation equations along the magnetic field line. The neutral particle transport is simulated by the Monte Carlo method. Their interactions through ionization and charge exchange processes are solved self-consistently with the scrape-off plasma by an iterative procedure. The ion flux in the scrape-off layer is amplified between the divertor throat and the divertor plate due to the recycling of the neutral particles. The range of the incoming ion flux which can cause high flux amplification for the FER divertor is studied. The effects of the radiations from the recycling neutrals and the oxygen impurities are roughly estimated. The relations between the effective conductance of the exhausting system and the neutral particle transmission probability through the divertor are evaluated to obtain the pumping requirement for the FER divertor. Finally the scrape-off plasmas in the DIII divertor chamber are numerically simulated for qualitative comparison with the experiments. M.G.

N84-21314# Nagoya Univ. (Japan).
EMISSION PROPERTIES OF HIGHLY IONIZED IRON SPECTRA FOR SPECTROSCOPIC PLASMA DIAGNOSITCS
K. Sato, Masamoto Otsuka, and Mikio Mimura (Osaka City Univ.) *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 41-54 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Three selected transitions of highly ionized iron in n = 2 level (the forbidden transition within the ground state configurations, Delta n = 0 transition, and Delta n - 1 transition) are primarily sensitive to particular plasma parameters. Measurement of these three transitions makes it possible to diagnose local plasma parameters. This method is useful to estimate the plasma parameters in the case of additional heating in plasmas. Preliminary experimental results are shown for Fe XVIII spectra during ion cyclotron radio frequency (ICRF) heating in JIPP T-IIU Tokamak. M.G.

N84-21315# Nagoya Univ. (Japan). Inst. of Plasma Physics.
EVALUATION OF EXCITATION CROSS SECTIONS BY PLASMA SPECTROSCOPY
Takako Kato and Takashi Fujimoto (Kyoto Univ.) *In its* Proc. of Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 55-75 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

The excitation cross sections from electron impact for highly ionized ions are evaluated using the spectroscopic data from plasmas. A computer code of the collisional radiative model for He-like ions is constructed and is applied to the estimation of the emission line intensities from the solar corona and theta pinch plasmas. The evaluation of the excitation cross sections as well as of the plasma state for He-like ions was made. M.G.

N84-21316# Osaka Univ. (Japan). Inst. of Laser Engineering.
DIAGNOSTICS AND SIMULATION IN G-XII IMPLOSION EXPERIMENTS
Yoshiaki Kato and Katsunobu Nishihara *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 76-82 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

High density implosion experiments become feasible with the completion of the Gekko XII glass laser system. Some of the important aspects of diagnostics and simulation in G-XII implosion experiments are reviewed. Author

N84-21317# Osaka Univ. (Japan). Inst. of Laser Engineering.
ATOMIC PROCESSES FOR MODELING OF INERTIAL CONFINEMENT FUSION PLASMA
Katsunobu Nishihara *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 83-93 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

The density and temperature of hot dense plasma that will be achieved in the cannonball target compression by the Gekko XII laser system are predicted by means of computer simulation. It is shown that the plasma is characterized by the two parameters kT is approximately epsilon sub F and Gamma is identical with Z(2)e(2)/R sub o kT is approximately 1 where epsilon sub F and R sub o are the zero temperature Fermi energy and the mean ion distance, respectively. The model of the code and required atomic properties are also briefly reviewed. M.G.

N84-21318# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ATOMIC COLLISION DATA FOR BEAM PROBE DIAGNOSTICS OF MAGNETICALLY CONFINED HIGH TEMPERATURE PLASMAS
Kiyoshi Kadota *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 94-125 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Beam probe methods for high temperature plasma diagnostics, in which atomic collision data play a very important role, are reviewed briefly. The cross sections for electron impact excitation and ionization of the probing particles are of use for the measurements of electron density and temperature. On the other hand, those for charge transfer between various plasma ions and the probing particles are useful for the measurements of proton and multiply charged impurity ion densities. The atomic collision data, which should be evaluated and compiled, are summarized. Author

N84-21319# Kyoto Univ. (Japan). Dept. of Engineering Science.
THE EFFECT OF EXCITATION ANISOTROPY IN THE LASER-INDUCED FLUORESCENCE SPECTROSCOPY OF PLASMAS
Takashi Fujimoto *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 126-138 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

The importance of the effect of alignment in the upper-level population and its collisional or radiative relaxation on the laser-induced fluorescence spectroscopy is pointed out. A method to take into account of the effect is presented. Author

N84-21320# Kyoto Univ. (Japan). Plasma Physics Lab.
SPECTROSCOPY IN HELIOTRON E
K. Kondo, N. Nishino, K. Magome, T. Mutoh, H. Kaneko, H. Zushi, O. Motojima, T. Obiki, A. Iiyoshi, and K. Uo *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 139-147 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Spectroscopic observations in the visible and vacuum ultraviolet region are presented. The Doppler broadening measurements in the visible wavelength region are routinely used to estimate ion temperature. Identification of the spectrum of the VUV region is made and a methodology to calibrate the sensitivity of the monochromator by using Ti XV emissions is described. Author

N84-21321# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
HIGH RESOLUTION X-RAY SPECTRA OF H- AND He-LIKE ARGON FROM THE ALCATOR C TOKAMAK
J. E. Rice, E. S. Marmar, E. Kaellne (J.E.T. Joint Undertaking),

and J. Kaellne (J.E.T. Joint Undertaking) *In* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 148-157 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

A compact, spatially scanable, curved crystal spectrometer was installed on the Alcator C Tokamak. Spectra from highly ionized argon were obtained and the spatial and temporal variations of several line ratios, as well as the ion temperature were determined. Author

N84-21322# Nagoya Univ. (Japan). Inst. of Plasma Physics.
ATOMIC AND MOLECULAR PROCESSES IN DISCHARGE CLEANING PLASMAS
Nobuaki Noda *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 158-169 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

The discharge cleaning process was analyzed on the basis of zero dimensional particle balance. An experimental result on the density dependence of the cleaning efficiency was interpreted using this simple model of particle balance. The relation among the plasma parameters and the control parameters was also investigated. Cross sections of some molecular processes near threshold energy were important for those analyses. Author

N84-21323# Nagoya Univ. (Japan). Institute of Plasma Physics.
A COMMENT ON ATOMIC PROCESSES RELEVANT TO ALPHA PARTICLE DIAGNOSTICS
M. Sasao and K. Sato *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 170-180 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Measurements of the alpha particle density and the velocity distribution in a magnetically confined deutrium/tritium (DT) burning plasma give requisite information on fusion plasma physics. The atomic processes relevant to alpha particle diagnostics, especially on atomic data for a neutral beam probe technique and on atomic data for the use of heavy ions was presented. A neutral atom injected neutralizes a fast alpha particle produced in the fusion through a two electron capture process and enables the alpha to escape from the magnetic field and to be detected. Several atomic cross sections are necessary to obtain the alpha particle density and the velocity distribution from the measured neutral spectra. The use of heavy ions as a diagnostic tool of alpha particles was also considered. Author

N84-21324# Osaka Univ. (Japan). Plasma Physics Lab.
ATOMIC HYDROGEN BEAM PROBING WITH SPECTROSCOPIC TECHNIQUE
S. Goto, Y. Itoh, and T. Ishihara *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 181-190 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Plasma diagnostics by means of spectroscopic analysis of injected atomic hydrogen beams and charge transferred ions in plasmas were discussed with relation to atomic cross sections requirements. Emphasis was focused on a magnetic field measurement and low z impurity concentration measurements. A conventional diagnostic beam source of atomic hydrogen was also presented. Author

N84-21325# Hiroshima Univ. (Japan). Faculty of Science.
ENERGY LEVELS AND TRANSITION PROBABILITIES OF LOW Z IONS FOR ELECTRIC FIELD DETERMINATION
Toshiatsu Oda, Tatehito Usui, and Ken Kawasaki (Okayama Univ.) *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 191-197 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Spectroscopic measurements are described of quasistatic electric fields in plasmas by laser fluorescence technique. A four level system was used, which was a modification of the usual three level system. Laser induced fluorescence of the forbidden line (463.6 nm) by the Li I 274.1 nm line was observed in lithium vapor to which a static electric field was applied up to 11 kV/cm. A possible energy level system of OVI was proposed. Author

N84-21326# Nagoya Univ. (Japan). Inst. of Plasma Physics.
WAVELENGTH MEASUREMENT OF X-RAY LINES FROM He-LIKE IONS
S. Morita and J. Fujita *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 198-210 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

X-ray lines from highly stripped ions produced in high temperature plasmas were observed using a crystal spectrometer, and the wavelengths of He-like resonance series lines 1snp-1s2 ($n<$ or $=3$) for iron and He-like resonance lines (1sp1p1-1s2150) from titanium through zinc were determined for the first time. Author

N84-21327# Queens Univ., Belfast (Northern Ireland). Dept. of Pure and Applied Physics.
CHARGE EXCHANGE AND RELATED PROCESSES
H. B. Gilbody *In* Nagoya Univ. Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 211-218 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Over the past five years, the charge transfer process X(q+) + H yields X(q-1)+ + H(+) has been the subject of considerable attention. Apart from H(+), He(+) and He2(+), there is particular interest in multiply charged plasma and wall effect impurity ions, e.g., C, O, Fe, Ni, Ti. Experimental and theoretical data are now available for many species over a wide energy range. Experiments, based mainly on the furnace target approach, have been mainly confined to the measurement of total cross sections sigma sub q, q-1 for electron capture into all final states of the product X(q-1)+ ion. Data accurate to within about 20% are now quite extensive for velocities $V < 1$a.u. where cross sections are decreasing with velocity and, for a given velocity, increase with q. At these high velocities, cross sections sigma sub q, q-1 for different ions with the same initial charge q are not greatly different and can be described by simple relations of the form sigma sub q, q-1 = (sigma sub o)(q to the n power). The empirical scaling parameters sigma sub o and n depend on velocity. Cross sections for state selective capture in atomic hydrogen were obtained spectroscopically. Experimental data is available for total electron capture cross sections in targets other than atomic hydrogen. M.A.C.

N84-21328# Nagoya Univ. (Japan). Dept. of Astrophysics.
SUMMARY OF THE SYMPOSIUM ON ATOMIC COLLISION DATA FOR DIAGNOSTICS AND MODELLING OF FUSION PLASMA
Satio Hayakawa *In its* Proc. on Symp. on Atomic Collision Data for Diagn. and Modelling of Fusion Plasmas Dec. 1983 p 219-228 refs (For primary document see N84-21310 11-75)
Avail: NTIS HC A11/MF A01

Fairly accurate numerical data is available for atoms, molecules, and their ionized states. Only a limited quantity of data is available as compared to the variety of data needed so compilation should not exclude data with notation that questions its reliability. Numerical simulation should clarify the relationship with the fewest possible parameters. The spatial profile of electron temperature was obtained from X-ray spectroscopy of forbidden and satellite lines relative to resonance lines. Laser induced fluorescence was employed for probing the electron density through competition between radiative transitions and collisional deexcitations. A spatial resolution of 100 nm in a high density plasma is achieved for X-ray imaging by the use of a random mask and a pinhole camera, while a time resolution of 100 ns is attained by an X-ray streak camera. In designing a plasma facility, atomic processes have to be taken into account for diagnostics and modeling. M.A.C.

N84-21329*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
RADICAL AND ION MOLECULE MECHANISMS IN THE POLYMERIZATION OF HYDROCARBONS AND CHLOROSILANES IN RF PLASMAS AT LOW PRESSURES (> 1.0 torR)
R. Avni, U. Carmi (Ben Gurion Univ. of the Negev, Beer Sheva, Israel), A. Inspektor (Nuclear Research Center Negev, Beer Sheva, Israel), and I. Rosenthal (Nuclear Research Center Negev, Beer Sheva, Israel) 13 Apr. 1984 24 p refs Presented at 11th Conf. Met. Coatings, San Diego, Calif., 9-13 Apr. 1984; sponsored by American Vacuum Society
(NASA-TM-83602; E-2019; NAS 1.15:83602) Avail: NTIS HC A02/MF A01 CSCL 20I

The ion-molecule and the radical-molecule mechanisms are responsible for the dissociation of hydrocarbons, and chlorosilane monomers and the formation of polymerized species, respectively, in the plasma state of a RF discharge. In the plasma, of a mixture of monomer with Ar, the rate determining step for both dissociation and polymerization is governed by an ion-molecular type interaction. Additions of H2 or NH3 to the monomer Ar(+) mixture transforms the rate determining step from an ion-molecular interaction to a radical-molecule type interaction for both monomer dissociation and polymerization processes. Author

N84-21330*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORRELATIONS BETWEEN PLASMA VARIABLES AND THE DEPOSITION PROCESS OF Si FILMS FROM CHLOROSILANES IN LOW PRESSURE RF PLASMA OF ARGON AND HYDROGEN
R. Avni, U. Carmi (Nuclear Research Center Negev, Beer Sheva, Israel), A. Grill (Ben Gurion University of the Negev, Beer Sheva, Israel), R. Manory (Ben Gurion University of the Negev, Beer Sheva, Israel), and E. Grossman (Ben Gurion University of the Negev, Beer Sheva, Israel) 13 Apr. 1984 18 p refs Presented at 11th Intern. on Met. Coatings, San Diego, Calif., 24-28 Jul. 1983; sponsored by American Vacuum Society
(NASA-TM-83603; E-2020; NAS 1.15:83603) Avail: NTIS HC A02/MF A01 CSCL 20I

The dissociation of chlorosilanes to silicon and its deposition on a solid substrate in a RF plasma of mixtures of argon and hydrogen were investigated as a function of the macrovariables of the plasma. The dissociation mechanism of chlorosilanes and HCl as well as the formation of Si in the plasma state were studied by sampling the plasma with a quadrupole mass spectrometer. Macrovariables such as pressure, net RF power input and locations in the plasma reactor strongly influence the kinetics of dissociation. The deposition process of microcrystalline silicon films and its chlorine contamination were correlated to the dissociation mechanism of chlorosilanes and HCl. Author

N84-21331*# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
FAST COLLISIONLESS TEARING IN AN ANISOTROPIC NEUTRAL SHEET Interim Report
J. Chen (Science Applications, Inc.), P. J. Palmadesso, J. A. Fedder, and J. G. Lyon 6 Feb. 1984 20 p Sponsored in part by NASA (RR0-3302-44)
(NASA-CR-175415; NAS 1.26:175415; AD-A137623; NRL-MR-5240) Avail: NTIS HC A02/MF A01 CSCL 20/9

This document studies the collisions tearing mode in a neutral sheet in the presence of ion temperature anisotropy using Vlasov description for both ions and electrons. GRA

N84-21332# California Univ., Livermore. Lawrence Livermore Lab.
NOVA LASER FACILITY FOR INERTIAL CONFINEMENT FUSION
W. W. Simmons 30 Nov. 1983 7 p refs Presented at 10th Symp. on Fusion Engr., Philadelphia, 5 Dec. 1983
(Contract W-7405-ENG-48)
(DE84-004190; UCRL-89759; CONF-831203-71) Avail: NTIS HC A02/MF A01

The NOVA laser consists of ten beams, capable of concentrating 100 to 150 kJ of energy (in 3 ns) and 100 to 150 TW of power (in 100 ps) on experimental targets by 1985. NOVA will also be capable of frequency converting the fundamental laser wavelength (1.0 microns) to its second (0.525 microns) or third (0.35 microns) harmonic. This additional capability (80 to 120 kJ at 0.525 microns, 40 to 70 kJ at 0.35 microns) was approved by the US Department of Energy (DOE) in Arpil 1982. These shorter wavelengths are much more favorable for ICF target physics. Current construction status of the NOVA facility, intended for completion in the autumn of 1984, will be presented. DOE

N84-21333# Kanner (Leo) Associates, Redwood City, Calif.
STARK SPECTROSCOPY OF HYDROGEN LINES IN TURBULENT PLASMA. 1: LOW-FREQUENCY TURBULENCE
A. B. Berezin, B. V. Liublin, and D. G. Iakovlev 1984 52 p refs Transl. into ENGLISH of "Shtarkovskaia Spektroskopiaa Vodorodnykh Linii v Turbulentnoi Plazme. 1: Nizkochastotnaia Tchrbchlentnost" rept. NIIEFA-P-K-0609 Nauchno-Issledovatelskii Inst. Elektrofizicheskoi Apparatury, Leningrad, 1983 Prepared for LASL, N. Mex.
(Contract W-7405-eng-36)
(DE84-004443; LA-tr-84-3; NIIEFA-P-K-0609) Avail: NTIS HC A04/MF A01

Set forth sequentially are the results of calculations of the Stark broadening of the spectral lines of hydrogen atoms H/sub alpha/, H/sub beta/ and H/sub gamma/ in plasma under the influence of low frequency (quasistatic) electric microfields. The results are presented in a form which is convenient for practical utilization during processing of the data of various experiments on the study of plasma. Also given are calculation formulas, graphs and tables, which associate the parameters of the plasma with the parameters of the profiles of the lines H/sub alpha/, H/sub beta/ and H/sub gamma/. Basic attention is given to spectroscopy of turbulent plasma. Along with the results of studies published earlier, a series of original results is set forth. Specifically, a method is proposed for measuring the parameters of a low frequency field according to the position of the center of gravity of the figure near half of the profile of the line. DOE

N84-21334# Los Alamos Scientific Lab., N. Mex.
MAGNETIC FIELD TOPOLOGIES OF THE RELAXED STATES OF TURBULENT DISCHARGES
Leaf Turner 1983 19 p refs Presented at the AGU Chapman Conf. on Magnetic Reconnection, Los Alamos, N. Mex., 3-7 Oct. 1983
(Contract W-7405-eng-36)
(DE84-004330; LA-UR-83-2691; CONF-8310229-3) Avail: NTIS HC A02/MF A01

The equation of zero-beta, hydromagnetic equilibrium: del x B = lambda B, which was long of interest to astrophysicists, has recently become of interest to fusion physicists as a result of its ability to describe the gross features of the magnetic configurations of finite-beta reversed field pinch and spheromak discharges. Not only does the equation describe the state of minimum magnetic energy for a fixed magnetic flux and magnetic helicity, but also it describes the mean magnetic field of an absolute equilibrium ensemble with magnetic energy, magnetic helicity, and magnetic flux constraints. Because of its utility, two cylindrically symmetric configurations recently were analytically solved. DOE

N84-21335# Texas Univ., Austin. Inst. for Fusion Studies.
NONLINEAR TRAPPED ELECTRON RESPONSE FOR DRIFT WAVE TURBULENCE IN TOKAMAKS
K. Swartz, P. H. Diamond, S. M. Mahajan, and R. D. Hazeltine Nov. 1983 60 p refs
(Grant DE-FG05-80ET-53088)
(DE84-005385; DOE/ET-53088/117; IFSR-117) Avail: NTIS HC A04/MF A01

The nonlinear trapped electron response to drift wave fluctuations is calculated using the coherent approximation to the DIA in action-angle variables appropriate for toroidal geometry. The bounce-averaged nonlinear response to low frequency electrostatic

fluctuations is computed. Employing a spectrum of Pearlstein-Berk structure modes satisfying the symmetry of the ballooning representation, the nonlinear terms are evaluated explicitly. Nonlinear effects do not significantly modify the trapped electron response. Quasi-neutrality and the nonlinear ion response can then be used in a sheared slab to obtain the turbulence level at saturation level. The level of trapped electron diffusion is calculated. DOE

N84-21336# California Univ., Los Angeles. Center for Plasma Physics and Fusion Engineering.
PROSPECTS OF THE SURFATRON LASER PLASMA ACCELERATOR
T. Katsouleas, C. Joshi, W. Mori, and J. M. Dawson 1983 4 p refs Presented at the 12th Intern. Conf. on High Energy Accelerators, Batavia, Ill., 11 Aug. 1983
(Grant DE-AS08-81DP-40163)
(DE84-005463; CONF-830822-50) Avail: NTIS HC A02/MF A01

The surfatron concept is proposed as a possible solution to the problem of staging in the laser-plasma beat wave accelerator scheme. Prospects of a 100 GeV particle accelerator based on the surfatron concept are explored. Finite angle optical mixing appears to be a promising solution for drastically reducing the width of the plane wave, thereby, making the required laser power and the device size realizable for a proof-of-principle experiment. DOE

N84-21337# Massachusetts Inst. of Tech., Cambridge. Plasma Fusion Center.
SLOSHING-ION EQUILIBRIA IN THE TARA ENDPLUGS
S. Hokin and J. Kesner Nov. 1983 26 p refs
(Contract DE-AC02-78ET-51013)
(DE84-003360; DOE/ET-51013/93; PFC/RR-83-22) Avail: NTIS HC A03/MF A01

A modified version of the LLNL Bounce average Fokker-Planck code to model neutral beam produced sloshing ion equilibria in the TARA endplugs was employed. The questions addressed concern the effect of deuterium beam operation as opposed to hydrogen operation, and the advantage of using fall energy beams rather than the usual three component beams. For the expected base case TARA operating parameters, a 40% savings in required beam power is attained by using deuterium beams rather than hydrogen beams, and that the use of full energy beams results in an additional 26% power savings for these parameters. For higher plasma temperatures the use of full energy beams becomes significantly advantageous. The equilibrium of two possible alternate mirror configurations for the TARA endplugs, believed to be more stable to trapped particle modes were investigated and those results reported. DOE

N84-21338# Grumman Aerospace Corp., Princeton, N.J.
MONTE CARLO STUDY OF ICRF START-UP AND SUSTAINED MODE OPERATION IN TANDEM MIRRORS
A. M. M. Todd 1983 37 p refs
(Contract DE-AC02-82ER-53140)
(DE84-005808; DOE/ER-53140/12) Avail: NTIS HC A03/MF A01

A study, using a Monte Carlo simulation code, of Ion Cyclotron Range of Frequency (ICRF) start up and sustained operation in tandem mirrors by way of ICRF end cell fueling and heating, is described. Although the basic parameter space considered corresponds to the Phaedrus experiment, the central cell density and temperatures are extended towards the reactor regime. Significant end cell potential barriers are generated with ICRF, but that due to choking of the central cell ion source stream by the barrier, saturation occurs and power requirements rapidly increase, so that density levels are limited to approx. twice the central cell ion temperature. Although performance is improved as the ion cyclotron resonance approaches the end cell midplane, no significant difference is found between inboard, outboard or double resonance location. As the central cell density and temperatures are increased, the RF power requirement is found to increase dramatically. DOE

N84-21339# California Univ., Livermore. Lawrence Livermore Lab.
TANDEM MIRROR FUSION RESEARCH
D. E. Baldwin 2 Dec. 1983 19 p refs Presented at the 6th Miami Intern. Conf. on Alternative Energy Sources, Miami Beach, Fla., 12-14 Dec. 1982
(Contract W-7405-eng-48)
(DE84-005133; UCRL-90036; CONF-831205-6) Avail: NTIS HC A02/MF A01

The tandem mirror program has evolved considerably in the last decade. Of significance is the viable reactor concept embodied in the MARS design. An aggressive experimental program, culminating in the operation of MPTF-B in late 1986, will provide a firm basis for refining the MARS design as necessary for constructing a reactor prototype in the 1990s. DOE

N84-21340# New York Univ., New York. Inst. of Mathematical Sciences.
AXISYMMETRIC, NON-IDEAL MHD STATES WITH STEADY FLOW
W. Kerner (Max-Planck Inst. fuer Plasmaphysik) and H. Weitzner Oct. 1983 39 p refs
(Contract DE-AC02-76ER-03077)
(DE84-006045; DOE/ER-03077/201) Avail: NTIS HC A03/MF A01

Toroidal plasma configurations with steady flow are studied in the framework of non-ideal MHD theory. The properties of the resulting set of equations are examined. The numerical solution of the two dimensional, nonlinear system appears feasible, although the large variation in the transport coefficients creates considerable numerical problems. DOE

N84-21341# Argonne National Lab., Ill. Office of Fusion Power Program.
MAGNET DESIGN APPROACH FOR PULSED TOKAMAK REACTORS
S. H. Kim, K. Evans, Jr., and D. A. Ehst Dec. 1983 6 p refs Presented at the 10th Symp. on Fusion Eng., Philadelphia, 5-9 Dec. 1983
(Contract W-31-109-eng-38)
(DE84-005261; CONF-831203-95) Avail: NTIS HC A02/MF A01

A choice of various operating modes of a Tokamak reactor will have considerable impact on the fatigue lives and cost of ohmic heating (OH), equilibrium field (EF), and toroidal field (TF) coils. OH and EF coil requirements and their costs, as well as the effects of the fringing fields of the EF coils on the TF coils, were studied under cyclic operation in the range of N = 10(2) to 10(6) cycles, spanning the range from a noninductively driven reactor (STARFIRE) to a conventional ohmically driven reactor. For a reference design of TF coils the design of the central OH solenoid was studied as a function of its maximum field, B/sup OH/. Increasing requirements for structural support lead to only negligible increases in volt-seconds for B/sup OH/ greater than or equal to 10.0 T. Fatigue failure of the OH coil is not a concern for N less than or equal to 10(5); for N approx. 10(6) fatigue limits the strain to small values, resulting in small increases in structual requirements and modest decreases in volt-seconds. DOE

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers.*

N84-21342# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
PROCEEDINGS OF THE CONFERENCE ON HIGH TEMPERATURE SOLID OXIDE ELECTROLYTES. VOLUME 1: ANION CONDUCTORS
F. J. Salzano, comp. Oct. 1983 367 p refs Conf. held in Upton, N.Y., 16-17 Aug. 1983 2 Vol.

(Contract DE-AC02-76CH-00016)
(BNL-51728-Vol-1) Avail: NTIS HC A16/MF A01

Research on solid oxide electrolyte fuel cell technology is discussed. Electrolytes supported on porous substrates using thinner electrolytes; compatibility electrodes, electrolytes, and interconnection materials; and testing of the stability of materials in actual operating environments are among the topics discussed. For individual titles, see N84-21343 through N84-21367.

N84-21343# Westinghouse Electric Corp., Pittsburgh, Pa.
CELL PERFORMANCE AND LIFE CHARACTERISTICS OF SOLID OXIDE ELECTROLYTE FUEL CELLS **c33**
Arnold O. Isenberg *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 5-15 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

The special design of state-of-the-art thin layer solid oxide electrolyte fuel cells (SOFC) requires special test equipment for performance and life tests of cells. Individual cells must be operated in a way that approaches operational conditions in multiple cell SOFC generators as closely as possible. Potential shortcomings in cell test rigs are discussed, as well as their effect on achieving meaningful performance and life data. The present status of cell technology is presented, as it relates to cell performance under realistic fuel conditions, i.e., composition and utilization. R.J.F.

N84-21344# Gas Research Inst., Chicago, Ill. Fuel Cell Technology.
CRITICAL ISSUES IN SOLID OXIDE FUEL CELL DEVELOPMENT **c33**
Diane Traub Hooie *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 17-27 (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Cell fabrication, electrical interconnection development, internal resistance, and thermal cycling of solid oxide fuel cells (SOFC) are discussed. Assuming the technical issues can be resolved, preliminary economic analysis indicates that a significant onsite market exists for SOFC's. In addition to being applicable to residential and commercial markets, this concept has the potential to address the industrial cogeneration market. Because of this market's requirement for large volumes of high quality heat, it is generally not accessible to low temperature fuel cells. The market potential is briefly discussed. R.J.F.

N84-21345# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Mater.
PROTON TRANSPORT IN BETA ALUMINA
K. G. Frase, J. O. Thomas, A. R. McGhie, and G. C. Farrington *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 23-35 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ER-10597; Grant NSF DMR-79-23647)
Avail: NTIS HC A16/MF A01

Two models were developed to describe the performance of solid oxide fuel cells: a cell model which calculates cell performance for various conditions of temperature, current density, and gas composition; and a system model which performs detailed heat and mass balances around each component in a power plant. The cell model provides insight into the performance tradeoffs in cell design. Further, the cell model provides the basis for predicting fuel cell performance in a power plant environment as necessary for the systems code. Using the two tools, analysis of an atmospheric pressure, natural gas fueled, internally reforming power plant confirms the simplicity and increased efficiency of a solid oxide fuel cell system compared to existing plants. R.J.F.

N84-21346# Westinghouse Electric Corp., Pittsburgh, Pa.
VAPOR DEPOSITION OF STABILIZED ZIRCONIUM OXIDE ELECTROLYTE AND LANTHANUM CHROMITE INTERCONNECTION FOR MULTIPLE CELL FABRICATION **c33**
Gregory E. Zymboly *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 39-44 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

Solid oxide fuel cell (SOFC) technology is advanced to the point where multiple cell fabrication and testing is warranted for extended life tests and analysis of failure modes. This requires larger numbers of cells of similar characteristics. Also the fabrication of the first SOFC generator (5kW size) will require a larger number of tubular cells. Until recently, only single cells could be processed in the existing deposition reactors. In order to establish the capability of preparing larger numbers of cells, a multiple-cell vapor deposition reactor was designed, built and tested. R.J.F.

N84-21347# Westinghouse Electric Corp., Pittsburgh, Pa. Material Science Div.
MICROSTRUCTURE-PROPERTY RELATIONSHIP FOR POROUS CaO STABILIZED ZrO2 SUPPORT TUBES **c25**
Barry R. Rossing *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 45-55 refs (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-17089)
Avail: NTIS HC A16/MF A01

The active elements of the Westinghouse solid oxide electrolyte fuel cell are supported on porous CaO stabilized ZrO2 tubes. These support tubes must possess adequate mechanical strength to survive both fabrication activities as well as long term cell operation. At the same time, gas diffusion rates through the porous structure must be high enough so as not to limit cell fabrication and cell operation processes that are dependent upon gas transport. Both mechanical properties and gas diffusion rates are strongly related to tube microstructure. These property-microstructure relationships are described. Using this understanding, porous support tubes with improved properties can be realized through compositional developments and/or processing innovations. R.J.F.

N84-21348# Ecole Nationale Superieure d'Electrochimie et d'Dlectrometallurgie, Cedex (France).
RESEARCH AND DEVELOPMENT ON HIGH TEMPERATURE WATER VAPOR ELECTROLYSIS **c25**
E. J. L. Schouler, J. C. Viguie (Centre d'Etudes Nucleaires de Grenoble), and L. J. Olmer (Centre d'Etudes Nucleaires de Grenoble) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 57-66 refs Sponsored in part by the Commission of the European Communities (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

The feasibility of elementary planar cells for high temperature water electrolysis based on yttria stabilized zirconia electrolytes is discussed. These cells are characterized by a large active surface area (approximately 50 sq cm) and a small electrolyte thickness (approximately 300 microns). Technological difficulties encountered in the fabrication procedure are presented. Parallel research on cathodic reaction kinetics emphasizes an electrocatalytic effect which is conducive to a large decrease of the cathodic overvoltage. This favorable effect, obtained by superficially doping the electrolyte surface with a specific redox couple is even larger the greater the hydrogen concentration. The results obtained give evidence of: an increase of about 10 to 50 in the electrolysis current for a ceria doped surface with nickel electrodes, and a large decrease of the cathodic overvoltage (up to 90%) at a given current when the molar fraction of H2 tends to unity. These results show a way to overcome the theoretical limitation associated with the tubular structure and may justify renewed interest in such a structure based on doped cells. R.J.F.

N84-21349# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Dept. of New Technologies.
HIGH TEMPERATURE ELECTROLYSIS OF WATER VAPOR. STATUS AND PERSPECTIVES OF THE GERMAN RESEARCH AND DEVELOPMENT ACTIVITIES **c25**
W. Doenitz, E. Erdle, and R. Schamm *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes,

Vol. 1 Oct. 1983 p 67-80 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

The thermodynamic advantages of electrolysis at very high temperatures, typically 900-1000 C, are discussed. After an explanation of the principal technical realization, the status of the advanced cell development is illustrated by some results of cell testing. Concepts for building up electrolysis units are introduced as well as the process engineering for electrolysis plants. Some perspectives for further improvements are explained. R.J.F.

N84-21350# Brookhaven National Lab., Upton, N. Y. Dept. of Nuclear Energy.
FUSION AND HIGH TEMPERATURE ELECTROLYSIS c25
J. A. Fillo, J. R. Powell, R. Benenati, and F. Malick (Westinghouse Electric Corp., Madison, Pa.) *In its* Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 81-88 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

A number of technical approaches for using the thermal energy produced in a high-temperature Tokamak blanket to provide the electrical and thermal energy required to drive a high-temperature (> 1000 C) water electrolysis process were investigated. Current emphasis is on two design points, one consistent with a peak electrolyzer temperature of approximately 1150 C (based on current laboratory experience with high-temperature, solid electrolyte fuel cells), and a second, consistent with a peak electrolyzer temperature of approximately 1300 C, which is an extrapolation of present experience. The technical integration of fusion and high-temperature electrolysis appears feasible. R.J.F.

N84-21351# Minnesota Univ., Minneapolis.
HIGH TEMPERATURE OXIDE ELECTROLYTES FOR THE SPLITTING OF WATER. THE ROC PROCESS c25
Edward A. Fletcher, Richard B. Diver, and Jon E. Noring (Sandia National Labs.) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 89-102 refs (For primary document see N84-21342 11-76)
(Contracts DE-AC02-82ER-12089; N00014-82-K-0523)
Avail: NTIS HC A16/MF A01

Solid oxygen passing membranes such as stabilized zirconia were proposed for use as membranes in high temperature water splitting processes. Two-membrane systems, reduced oxygen concentration (ROC), which use a hydrogen passing membrane as well are discussed. An advantage of a two-membrane system is that water may be split in a single passage through the device, thus decreasing substantially thermodynamic losses associated with the heat exchanger and other appurtenances. Some problems such as the stability of hydrogen passing membranes in a water atmosphere are addressed. It is suggested that the ROC process may provide a means of protecting hydrogen passing membranes, and that electric ROCs may be unusually well suited for operation at temperatures at which palladium membranes might be used. The thermal efficiencies of two membrane systems with and without electrical enhancement are compared. R.J.F.

N84-21352# Moscow Steel and Alloys Inst. (USSR).
HIGH TEMPERATURE SOLID OXIDE ELECTROLYTES FOR RESEARCH IN METALLURGICAL PROCESSES AND STEELMAKING c26
D. I. Ryzhonkov, S. N. Paderin, and S. I. Chemeris *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 103-125 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

The results of metallurgical process investigations in metal oxidation refining with the help of solid oxide electrolytes both under laboratory and industrial conditions are given. Production of iron and steel is based on reactions of reduction and selective oxidation of elements in which oxygen takes part. Activity of oxygen dissolved in the metallic bath determines possibilities of oxidation refining and results of steel deoxidation. Application of high temperature solid oxide electrolytes in steelmaking gives a quantitative information about the activity of dissolved oxygen. It is a basis of controlling the technological processes of steelmaking and steel teeming. This is a qualitatively new level of the technological process control which becomes possible only after the application of high temperature solid oxide electrolytes. R.J.F.

N84-21353# Naval Research Lab., Washington, D. C. Chemistry Div.
ELECTROCHEMICAL APPLICATIONS OF STABILIZED ZIRCONIA c25
Kurt H. Stern *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 127-139 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Various uses made of stabilized zirconia (SZ) are described. They can be placed in two categories: those in which virtually no charge is passed (equilibrium applications), and dynamic applications in which substantial amounts of charge are passed through the SZ. First the interfacial processes occurring in both applications are described. R.J.F.

N84-21354# Imperial Coll. of Science and Technology, London (England). Dept. of Metallurgy and Materials Science.
ENERGETICS OF OXYGEN ION TRANSPORT IN FLUORITE, PEROVSKITE AND OTHER OXIDE STRUCTURES
B. C. H. Steele and J. A. Kilner *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 141-155 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

The energetics of oxygen ion mobility in the well known fluorite oxide systems are examined. It is demonstrated that relatively simple point defect associate models can explain the different magnitudes of ionic conductivity in these systems; moreover the activation energy for conduction is strongly dependent upon dopant cation size. The problems associated with optimizing oxygen ion mobility in the pyrochlore oxide system are discussed. A summary of the unique properties of Bi_2O_3 based materials is given. It is also concluded that prospects for high oxygen ion mobility in the perovskite oxide system are not very encouraging, and that the relatively high values for oxygen chemical diffusion coefficients reported in certain of these oxides are probably due to an erroneous interpretation of the data. An analysis of A.C. conductivity data in terms of the development of the associated microstructure of partially stabilized zirconia (PSZ) ceramics is given. The analysis suggested that doped tetragonal zirconia should exhibit an ionic conductivity comparable to the fully stabilized cubic zirconia (FSZ). R.J.F.

N84-21355# Tata Research Development and Design Centre, Pune (India).
TRANSPORT PROPERTIES OF FLUORITE OXIDES
E. C. Subbarao and H. S. Maiti (Indian Inst. of Technology) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 157-170 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Theoretical aspects of ionic transport have been revised from the phenomenological and atomistic points of view. Experimental results on ionic conductivity and diffusion coefficient for the important oxide electrolytes are discussed. Compositional dependence of ionic conductivity of the electrolytes have been explained on the basis of both short and long range interactions between the oxygen vacancies and the impurity cations. Importance of grain boundaries on the electrical conductivity and the characteristics of electronic conduction in these electrolytes are discussed.
Author

N84-21356# Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
TRANSPORT PROPERTIES OF SELECTED METAL OXIDES
J. M. Honig and M. Pai *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 171-214 refs (For primary document see N84-21342 11-76)

Avail: NTIS HC A16/MF A01

The transport properties of several oxides useful as electrodes in high temperature electrolytes are briefly reviewed. Elements of the basic theory pertaining to band structures in RuO2 and to energy states in small polaron materials are described. The appropriate transport theories are then discussed for motion of electrons as well as for ionic diffusion; conditions are prescribed that favor mixed conduction processes. Background information is provided for attainment of mixed conduction in terms of changes in crystal composition, activation energies for diffusion, equilibration pressures, and operating temperatures, for the specific case of materials subject to Frenkel disorder. The experimental results and theoretical band structure calculations relating to RuO2 are discussed in some detail. Finally, the cases of several mixed ionic conductors are taken up. Author

N84-21357# Wake Forest Coll., Winston-Salem, N.C. Dept. of Physics.

ATOM-JUMP VERSUS CONTINUOUS MODELS FOR FAST ION CONDUCTION

Guy M. Beaver and Ysbrand Haven *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 215-228 refs (For primary document see N84-21342 11-76)

Avail: NTIS HC A16/MF A01

The self correlation function G sub s (r,t) = (P(r,t)-P(O,O)), introduced by van Hove in the theory of neutron scattering, has been calculated for several lattices and used to calculate the scattering function (Kappa, omega). In this paper the results have been compared with the Mossbauer linewidth caused by diffusion of Fe in Cu or with the effect of diffusion on neutron scattering by AgI, Ag2Se and other fast ion conductors. A correlation factor is needed which is identical with the correlation factor for tracer diffusion. The positions of a diffusing atom can be monitored by the incoherent neutron scattering method better when the scattering wavevectors would be increased somewhat over the presently used values. Author

N84-21358# Columbia Univ., New York.

MICROSTRUCTURE AND MICROANALYSIS IN RELATION TO THE GRAIN BOUNDARY CONDUCTIVITY EFFECT IN DOPED CERIA

R. Gerhardt-Anderson, A. S. Nowick, M. E. Mochel (Illinois Univ., Urbana), and I. Dumler (Illinois Univ., Urbana) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 229-243 refs (For primary document see N84-21342 11-76)

(Contract DE-AC02-78ER-04693)

Avail: NTIS HC A16/MF A01

TEM and STEM methods have been employed in order to determine the origin of the grain boundary effect in doped ceria solid electrolytes. This is the electrical effect which manifests itself as an extra arc in the complex impedance plot. All samples examined were found to contain varying amounts of mostly Si amorphous phases in the form of thick boundaries and second phase particles. It is concluded that the grain boundary effect is due to the presence of the thick boundaries which serve as a blocking layer to the ionic carriers. Furthermore, it was also found that Y doping results in the formation of a stable precipitate of approximate composition Y(0.6)Si(0.2)O(X) which appears to scavenge Si, and thus may serve to decrease the grain boundary effect in these materials. R.J.F.

N84-21359# Missouri Univ., Rolla. Dept. of Ceramic Engineering.

REDOX BEHAVIOR OF HIGH TEMPERATURE ELECTRODES

H. U. Anderson, B. K. Flandermeyer, M. M. Nasrallah, and A. Agarwal *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 245-258 refs (For primary document see N84-21342 11-76)

(Contract DE-AC02-80ER-10598)

Avail: NTIS HC A16/MF A01

The stability of high temperature fuel cell electrodes to their ambient environment is important for the long term reliability of fuel cells. In this report the behavior of oxide electrode materials as a function of oxygen activity and temperature is considered. Models for the oxidation-reduction behavior of both p and n type oxides are presented. These models take into account the absorption and evolution of oxygen which take place as oxygen activity is varied. The resulting instability in electrical conductivity is explained as a consequence of changes in carrier concentration due to variability in ionic defect concentration. The proposed models are applied to acceptor doped LaCrO3 and donor doped SrTiO3. It is shown that the models explain the experimental data well and as a consequence diagrams can be made which show the regions of oxygen activity and temperature for which stability of electrical conductivity and defect structure might be expected. Author

N84-21360# Pacific Northwest Lab., Richland, Wash. Materials Dept.

PREPARATION AND PROPERTIES OF ELECTRICALLY CONDUCTING CERAMICS BASED ON INDIUM OXIDE-RARE EARTH OXIDES-HAFNIUM OXIDE **c27**

D. D. Marchant and J. L. Bates *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 259-267 refs (For primary document see N84-21342 11-76)

Avail: NTIS HC A16/MF A01

Electrically conducting refractory oxides based on adding indium oxide to rare earth-stabilized hafnium oxide are being studied. The use of indium oxide generally increases the electrical conductivity. The results of measurements of the electrical conductivity and data on corrosion resistance in molten salts are presented. Author

N84-21361# National Bureau of Economic Research, Inc., Washington, D. C.

MICROSTRUCTURE AND ELECTRICAL PROPERTIES OF CERIA-BASED CERAMIC ELECTROLYTES **c27**

A. L. Dragoo and C. K. Chiang *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 268-281 refs (For primary document see N84-21342 11-76)

Avail: NTIS HC A16/MF A01

High-density, yttria and gadolinia-doped ceria ceramics were found to exhibit notable differences in electrical properties which correlated with differences in the processing methods used to form the materials. Dopant concentrations of 8.5 and 30 mole percent with respect to cation concentration were prepared. Three chemical processes were used to prepare well-mixed precursors which were calcined to oxide powders. Following forming and isostatic compaction, most samples were thermally sintered. One billet with 8.5 mole percent Y was hot-pressed. Densities of samples ranged from 92 to $>$ 99.5 percent of theoretical density. The AC impedance of grain interiors (lattice impedance) and of grain-boundaries and other inhomogeneities (inhomogeneity impedance) were measured over a frequency range of 50 Hz to 13 MHz, from 200 to 550 C, in air. Lattice impedance appeared to depend primarily on dopant concentration, with the exception of the hot-pressed material for which a deviation from the general behavior was noted. Inhomogeneity impedance appeared to be influenced by calcination temperature, densification method and dopant concentration. B.W.

N84-21362# Westinghouse Electric Corp., Pittsburgh, Pa.

AC MEASUREMENTS ON FUEL CELLS AND FUEL CELL COMPONENTS **c33**

James E. Bauerle *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 283-293 refs (For primary document see N84-21342 11-76)

(Contract DE-AC02-80ET-17089)

Avail: NTIS HC A16/MF A01

AC impedance measurements on fuel cells can provide information on a variety of cell processes, such as ionic and

electronic resistance, electrode charge transfer resistance, electrode interfacial capacity, and mass transfer effects associated with porous electrodes such as gas diffusion resistance and closed-pore capacity. Some experimental results for thin film solid oxide fuel cells will be interpreted in terms of the above processes. An important practical application of AC measurements to solid oxide fuel cell development is for the determination of individual thin film component resistances. The electrolyte film is particularly critical because of possible interfacial resistance effects at either the air or fuel electrode boundaries. Experimental techniques and some results for this type of measurement will be discussed.
Author

N84-21363# Westinghouse Electric Corp., Pittsburgh, Pa.
SOME NON-ELECTROCHEMICAL REQUIREMENTS FOR AIR ELECTRODE MATERIALS OF HIGH TEMPERATURE SOLID ELECTROLYTE FUEL CELLS **c25**
R. Ruka *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 295-302 (For primary document see N84-21342 11-76)
(Contract DE-AC02-80ET-10789)
Avail: NTIS HC A16/MF A01

Non-electrochemical properties of air electrode materials, including thermal expansion, sintering behavior, dimensional changes due to changing oxygen partial pressure and chemical interactions with other cell components, affect the mechanical and chemical integrity of high temperature solid electrolyte fuel cells. Experimental examples of some of the properties which result in undesired dimensional changes are discussed. Author

N84-21364# Illinois Univ., Urbana. Dept. of Ceramic Engineering.
DEFECT ELECTROCHEMISTRY OF OXIDE ELECTRODES
G. P. Wirtz and H. S. Isaacs (Brookhaven National Lab.) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 303-321 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

The polarization in an electrochemical cell may be represented by the sum of a number of overpotentials which arise during the passage of current through the cell. The product of this sum and the cell current is the energy loss during cell operation. At the oxygen electrode in a stabilized zirconia based cell the polarization process is often markedly dependent on the electrode material as evidenced in point contact measurements. In many cases the observations may be rationalized in terms of a model based on a Langmuir adsorption isotherm for oxygen in which the rate limiting step in the electrode reaction is the adsorption-desorption of oxygen on the electrode surface. This model predicts cathodic and anodic currents limited respectively by the complete depletion and complete coverage of the surface by adsorbed oxygen. B.W.

N84-21365# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
USE OF SINGLE POINT CONTACT ELECTRODES TO UNDERSTAND POROUS ELECTRODE BEHAVIOR ON SOLID ELECTROLYTES
Clovis A. Linkous *In its* Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 323-330 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Although one of the principle reasons for choosing high temperature solid electrolyte fuel cells over other fuel cell technologies is that activation overpotentials are generally reduced, electrocatalyst requirements such as high conductivity, thermal and chemical stability, compatible thermal expansion, cost, and ease of fabrication may force a compromise with respect to electrode activity. Thus, even at 1000 C, activation overpotentials may still cause a substantial efficiency loss in fuel cell performance. Now that the basic compositions of anode and cathode materials have been decided upon for most R&D groups in this area, a methodology by which the activation overpotential can be precisely measured is needed. Once known, it can be compared to the magnitudes of other overpotential losses so that the proper amount of attention and effort be allocated to each item. This paper describes a method in which point contact electrodes are used to directly measure activation overpotentials. B.W.

N84-21366# Stanford Univ., Calif. Dept. of Chemical Engineering.
MECHANISMS OF CATALYTIC OXIDATION OF HYDROCARBONS IN A SOLID-ELECTROLYTE FUEL CELL **c25**
Bang C. Nguyen and David M. Mason *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 331-347 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Results presented in this paper are part of an ongoing investigation of the electrocatalytic mechanisms involved in the anodic oxidation of hydrocarbons and the cathodic reduction of O2 in a fuel cell employing Sc2O3- or Y2O3-stabilized ZrO2. The general status of the electrochemical studies is reviewed. The particular focus of this paper is on experiments performed to test the assumption that the solid electrolyte plays an important role in electrocatalysis compared to the porous metallic electrode. It has been observed that great enhancement in reaction-rates and current drawn at a given overpotential occurs when the electrolyte is blackened by electrolysis, forming a suboxide of zirconia, ZrO2-x. Simple potentiometric measurements with H2 as the fuel and air as oxidant have been made on both the unblackened and blackened ZrO2-Sc2O3 system. B.W.

N84-21367# Imperial Coll. of Science and Technology, London (England). Dept. of Metallurgy and Material Science.
OXYGEN EXCHANGE MEASUREMENTS ON ZIRCONIA-YTTRIA ELECTROLYTE SURFACES MODIFIED BY VARIOUS DOPANTS **c25**
D. S. Tannhauser, J. A. Kilner, and B. C. H. Steele *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 1 Oct. 1983 p 349-360 refs (For primary document see N84-21342 11-76)
Avail: NTIS HC A16/MF A01

Yttria stabilized zirconia (YSZ) has a number of practical applications as electrolyte membrane. Current interest is focused on three main devices: oxygen monitors, high temperature fuel cells, and water electrolyzers. Little is known about factors which affect the interchange of oxygen between the ambient gas and the oxide surface. Surface perfection and purity, as well as crystalline orientation, may all play a role. In view of the growing requirement for devices to operate at low temperatures (approx. 500 C), where the surface exchange becomes very slow, it is important to understand this process. Recent experiments have suggested that surface treatment of zirconia with CeO2 may accelerate reaction kinetics at electrodes. Another series of experiments by Verkerk et al has suggested that in the low temperature regime Bi2O3 - Er2O3 has much faster transfer rate for oxygen than YSZ. Consequently, a series of experiments have been started to investigate the effects of chemical treatments on the exchange of oxygen between the surface of YSZ single crystals and oxygen in the gas phase. B.W.

N84-21368# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
PROCEEDINGS OF THE CONFERENCE ON HIGH TEMPERATURE SOLID OXIDE ELECTROLYTES. VOLUME 2: CATION CONDUCTORS
F. J. Salzano, comp. Oct. 1983 142 p refs Conf. held in Upton, N.Y., 16-18 Aug. 1983 2 Vol.
(Contract DE-AC02-76CH-00016)
(BNL-51728-Vol-2) Avail: NTIS HC A07/MF A01

The following areas were discussed: phase transformations of beta-aluminum oxides, transpot behavior, thermal stability, ion transport, relation between structure and conductivity, solid solution, solid electrolytes, and sodium sulfur batteries. For individual titles, see N84-21369 through N84-21379.

N84-21369# Brookhaven National Lab., Upton, N. Y. Dept. of Applied Science.
RE-EXAMINATION OF BETA-ALUMINA DOPED WITH CHROMIUM USING PHOTOACOUSTIC SPECTROSCOPY c25
Ann M. Schuler, John H. Kennedy (California Univ., Santa Barbara), and George E. Cabaniss (North Carolina Univ., Chapel Hill) *In its* Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 1-12 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

A previous publication presented evidence that strongly supported the hypothesis that chromium-doped beta alumina was oxidized to Cr (IV) during air-sintering. This evidence included chemical reactions observed, magnetic susceptibility, and conductivity, but, in particular, the strongest supporting evidence came from absorption spectroscopy. However, the technique used, powder dispersed in a KBr pellet, was not conductive to high quality spectra. For this reason, a much more powerful technique for solid samples, photo-acoustic spectroscopy, was applied to chromium-doped beta alumina. Additional absorption peaks were observed that now clearly show that chromium remains as Cr (III) in beta alumina. The other previous evidence was reexamined and it too is interpreted as resulting from the presence of chromium (III). Author

N84-21370# California Univ., Los Angeles. Dept. of Materials Science and Engineering.
TRANSPORT BEHAVIOR OF MULTIVALENT BETA ALUMINAS
B. Dunn and G. C. Farrington (Pennsylvania Univ., Philadelphia) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 13-22 refs 2 Vol. (For primary document see N84-21368 11-76)
(Contracts N00014-81-K-0526; N00014-83-K-0498; Grant NSF DMR-79-23647)
Avail: NTIS HC A07/MF A01

Ion exchange reactions were used to substitute divalent and trivalent cations for the entire sodium ion content of sodium beta double prime alumina. A wide range of divalent and trivalent beta double prime aluminas were synthesized which exhibited conductivities much greater than any other divalent or trivalent solid electrolyte in the 300 to 400 C range. The multivalent beta double prime aluminas greatly extend the opportunities for electrochemical sensors based on solid electrolytes. Author

N84-21371# Pennsylvania Univ., Philadelphia. Lab. for Research on the Structure of Mater.
PROTON TRANSPORT IN BETA ALUMINA
K. G. Frase, J. O. Thomas, A. R. McGhie, and G. C. Farrington *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes Oct. 1983 p 23-35 refs (For primary document see N84-21368 11-76)
(Contract DE-AC02-80ER-10597; Grant NSF DMR-79-23647)
Avail: NTIS HC A07/MF A01

Protonic beta double prime-aluminas were extensively studied during the past fifteen years. The results of new investigations of the preparation, stability, conductivity, and structure of selected hydronium and ammonium/hydronium beta double prime-aluminas are presented. These compositions are two examples in a continuum of protonic beta double prime-aluminas all of which are unusually stable solid state proton conductors. Author

N84-21372# Washington Univ., Seattle. Dept. of Electrical Engineering.
BOROPHOSPHATE VITREOUS ELECTROLYTES: THE RELATIONSHIP BETWEEN LOCAL ORDER, THERMAL STABILITY AND ION TRANSPORT
J. L. Bjorkstam, M. Villa, G. Chiodelli (Pavia Univ.), and A. Magistris (Pavia Univ.) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 37-45 refs Sponsored in part by CNR (For primary document see N84-21368 11-76)
(Contract DE-AM06-76PR-0225)
Avail: NTIS HC A07/MF A01

Ion conducting borate and phosphate glasses are outlined with emphasis being placed in illustrating the relationship among glass composition, glass structure and transport properties. Then, an experimental study of the AgI-doped borophosphate glasses is presented which includes discussion of the glass forming properties, thermal stability and ionic conductivities for the quaternary system AgI:Ag2O:B2O3:P2O5. In the glasses without AgI and with the same Ag20 molar fraction, the conductivity at room temperature (rt) is a highly non-linear function of the B/P ratio. By appropriately mixing boron and phosphorus oxides, undoped glasses are obtained with better rt conductivities and thermal stability than the corresponding glasses made with a single glass former (mixed anion effect). Author

N84-21373# Zurich Univ. (Switzerland). Physik Inst.
MEASUREMENT OF DIFFUSION CONSTANT BY PULSED MAGNETIC FIELD GRADIENT NMR IN Ag26I13W4O16 RbAg4I5 AND KAg4I5
D. Brinkmann, A. Dommann, H. Looser, M. Mali, and R. Roos *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 47-57 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

The pulsed magnetic field gradient method to measure self-diffusion constants by nuclear magnetic resonance is described. Examples of the application of this method to the measurement of the Ag-109 diffusion constant in solid electrolytes are given. The activation energies for the Ag diffusion in MAg4I5 (M = Rb, K) are as follows: 0.12 eV for the alpha phase in both compounds, 0.16 eV and 0.18 eV for the beta phases of RbAg4I5 and KAg4I5, respectively, all values with an error of + or - 0.01 eV. In both compounds, the diffusion constant changes discontinuously at the alpha yields beta transition. In terms of the Haven ratio a decrease from 0.51 to 0.39 is observed for the alpha yields beta + or - transition which is taken as evidence for an increased correlation of the Ag motion in the beta phase. In Ag26I18W4O16 where the existence of 3 phase transitions at 277 K, 247 K and 199 K could be confirmed, Ag diffusion was measured along the a and the c* axis with an anisotropy of less than 20% between 250 K and 345 K. The activation energies are 0.16 + or - 0.02 eV (alpha phase) and 0.28 + or - 0.02 eV (beta phase). Author

N84-21374# Massachusetts Inst. of Tech., Cambridge. Dept. of Materials Science and Engineering.
RELATION BETWEEN STRUCTURE AND CONDUCTIVITY IN THE NASICON SOLID SOLUTION SYSTEM
B. J. Wuensch, L. J. Schioler, and E. Prince (National Bureau of Standards) *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 59-74 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

The changes in crystal structure which accompany the marked increase in conductivity with change of composition in the NASICON system Na(1+x)Zr2Si(x) P(x-x) were established by Rietveld analysis of neutron powder diffraction data. Structural parameters were refined for samples extending across the system: x = 1.0, 2.5 and 3.0 (hexagonal, R3 bar c) and x = 1.6 and 2.0 (mono-clinic, C2/c). The Na(1) site occupied in x = 0 remains fully occupied; Na(2) fills progressively with increasing x. In the monoclinic phases. Na(2) splits to two symmetry-independent positions which are not equally occupied. Extrapolation indicates that these sites have equal occupancy (i.e., equal energy) at x = 2.1, a composition close to that of maximum conductivity. The principal change in the framework with change is composition is distortion and increasud rotation of the orientation of the Si/P tetrahedron up to x = 2, followed by progressive return towards the original orientation for larger x. The rotation stretches the length of the Na(1) octahedron along c and accounts for an anomalous maximum in the variation of c with composition. Author

N84-21375# Paris-Sud Univ., Orsay (France).
ION-ION CORRELATIONS AND PHASE TRANSITIONS IN NAS-

CION TYPE MATERIALS
G. Collin, J. P. Boilot (Ecole Polytechnique, Palaiseau, France), M. delaRochere, and R. Comes *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 75-94 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

Two main ways are used in order to approach the problems of Nasicon materials. First with a study of Nasicon analogs Na3M2 (PO4)3 - M = Sc, Cr, Fe which reveals that the phase transitions observed are essentially associated to successive losses of order i) on Na(1) sites and ii) on Na(2) sites. In the high temperature phase -superionic- the Na+ ions exhibit only very short-range order. Second the non stoichiometry mechanism is studied on Na(1+x+4y)Zr(2-y)P(3-x)Si(x)O12 materials with the occurence -associated with the Zr-Na and P-Si substitutions of i) a non mobile Na(3) site and ii) of an interstitial Na(4) one. The phase transitions are discussed in relation with the framework changes versus T. Author

N84-21376*# EIC, Inc., Newton, Mass.
MODERATE TEMPERATURE RECHARGEABLE NaNiS2 CELLS c33
K. M. Abraham *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 95-105 refs (For primary document see N84-21368 11-76)
(Contract NAS3-21726)
Avail: NTIS HC A07/MF A01 CSCL 09C

A rechargeable sodium battery of the configuration, liquid Na/beta double prime -Al2O3/molten NaAlCl4, NiS2, operating in the temperature range of 170 to 190 C, is described. This battery is capable of delivering > or = to 50 W-hr/1b and > 1000 deep discharge/charge cycles. Author

N84-21377# Chloride Silent Power Ltd., Runcorn (England).
THE PREPARATION OF SODIUM BETA-ALUMINA BY THE ISOSTATIC PRESSING AND ZONE SINTERING OF SPRAY DRIED POWDERS c27
Stephen R. Tan *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 107-124 refs (For primary document see N84-21368 11-76)
Avail: NTIS HC A07/MF A01

The preparation of beta-alumina tubes by a route comprising a slurry solution spray drying, iosostatic pressing and zone sintering is reported. Sources of powder heterogeneity are discussed as is the conversion of precursor materials to beta-alumina during firing. Data demonstrating the effectiveness of post-sinter heat treatment for beta-alumina are presented. Author

N84-21378# Purdue Univ., Lafayette, Ind. School of Materials Engineering.
SYNTHESIS OF Co2+ AND Ni2+ STABILIZED BETA ALUMINA c27
S. Chen, D. R. White, H. Sato, C. J. Sandberg, and H. R. Harrison *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Electrolytes, Vol. 2 Oct. 1983 p 125-134 refs (For primary document see N84-21368 11-76)
(Grants NSF DMR-80-20249; NSF DMR-79-11137)
Avail: NTIS HC A07/MF A01

By using a skull melting technique, both single crystalline Ni(2+) and Co(2+) stabilized beta double prime-aluminas and doped beta-aluminas have been synthesized. Both Ni(2+) and Co(2+) beta-aluminas are blue in color, although the Co(2+) material has a deeper hue. Analysis of their visible absorption spectra indicated that the divalent transition metal ions are situated in tetrahedral sites of the spinel blocks. Author

N84-21379# Rutgers Univ., New Brunswick, N. J. Dept. of Chemistry.
IONIC CONDUCTIVITY IN LITHIUM HEXAOXOMETALLATE SOLID SOLUTIONS
E. Nomura and M. Greenblatt *In* Brookhaven National Lab. Proc. of the Conf. on High Temp. Solid Oxide Elctrolytes, Vol. 2 Oct. 1983 p 135-142 refs (For primary document see N84-21368 11-76)
(Contract N00014-82-K-0317)
Avail: NTIS HC A07/MF A01

Lithium ion conductivity in solid solutions formed between Li7TaO6, Li7MVO6 (MV = Nb, Bi) and Li8ZrO6 was measured as a function of temperature and composition using complex impedance method. The samples prepared were Li7Ta(l-x)Nb(x)O6, Li7Ta(l-x)Bi(x)O6 and Li(7+x)Ta(l-x)Zr(x)O6. At 200 C, the conductivities of Li7TaO.7NbO.3O6, Li7TaO.6BiO.4O6 and Li7.4TaO.6ZrO.4O6 are .00043/(omega cm.), .0003/(omega cm) and .0004/(omega cm), respectively. Author

N84-21380# Duke Univ., Durham, N. C. Dept. of Chemistry.
ELECTROHYDRODYNAMIC AND FLOW INSTABILITIES IN NEMATIC POLYMERS Final Report, 1 Dec. 1980 - 30 Nov. 1983
William R. Krigbaum 28 Jan. 1984 10 p
(Contract DAAG29-81-K-0023)
(AD-A137812; ARO-17312.2-CH) Avail: NTIS HC A02/MF A01 CSCL 20/2

A nematic phase interacts more strongly with an external field than does an ordinary liquid because the molecules in the nematic phase interact cooperatively. We have investigated a variety of thermotropic polymers to ascertain which of the polymers having mesogenic units as part of the main chain, and the conditions under which these occur. The higher viscosity of a polymeric mesophase leads to longer domain formation times, but it does offer some advantages which can be exploited under certain circumstances. Author (GRA)

N84-21381# California Univ., Berkeley. Electronics Research Lab.
STUDIES OF 3-5 COMPOUND SEMICONDUCTORS FOR OPTICAL AND MICROWAVE APPLICATIONS Final Report, 15 Jun. 1980 - 31 Aug. 1983
S. Wang 2 Jan. 1984 12 p
(Contract DAAG29-80-K-0011)
(AD-A137849; ARO-17103.18-EL) Avail: NTIS HC A02/MF A01 CSCL 20/12

Compound semiconductors of GaAs and (GaAl) As were studied for optical and microwave applications. Two growth processes were employed for device fabrication: (1) the liquid-phase epitaxy (LPE), and (2) the molecular beam epitaxy (MBE). The procedure for LPE growth was well established in the laboratory. On the other hand, the MBE growth process required a considerable amount of effort to establish the growth procedure and optimize the growth conditions. Author (GRA)

N84-21382# Michigan Technological Univ., Houghton.
PROPERTIES OF 3-DIMENSIONAL ENERGETIC SOLIDS AND MOLECULAR CRYSTALS Annual Technical Report, 1 Jul. - 31 Dec. 1983
A. Barry Kunz (Illinois Univ., Urbana-Champaign), T. O. Woodruff (Michigan State Univ., East Lansing), D. R. Beck, and R. S. Weidman 1 Feb. 1984 8 p
(Contract N00014-81-K-0620)
(AD-A137927; ATR-3) Avail: NTIS HC A02/MF A01 CSCL 21/2

The effect of excition formation upon combustion of solid fuels is examined by applying ab initio theory to solid and gas phase nitric oxide and its dimer. Author (GRA)

N84-21383# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
A FAR-INFRARED LASER STUDY OF SMALL-AREA SUPERCONDUCTING TUNNEL JUNCTIONS Interim Report
William C. Danchi Oct. 1983 224 p
(Contracts N00014-83-K-0383; N00014-75-C-0648; NR Proj. 319-116; NR Proj. 372-012)
(AD-A137186; DAS-TR-22) Avail: NTIS HC A10/MF A01 CSCL 20/12

This document reports the first observations of photon-assisted

quasiparticle tunneling and AC Josephson effect in superconducting tunnel junctions irradiated with far-infrared radiation. GRA

N84-21384# Northeastern Univ., Boston, Mass. Dept. of Physics.
OSCILLATORY LENGTH DEPENDENT CONDUCTIVITY IN PERIODIC AND ALMOST PERIODIC CRYSTALS
J. B. Sokoloff Jun. 1983 17 p refs
(Contract DE-AC02-81ER-10866)
(DE84-004364; DOE/ER-10866/T2; NUB-2606) Avail: NTIS HC A02/MF A01

Large oscillations as a function of system length are found numerically in the transmissions coefficient and hence, conductivity of a finite almost periodic system for a particular value of the energy and potential strength. This behavior is reminiscent of that which is shown to occur for any periodic system of finite length near a band edge. DOE

N84-21385# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
THE GROWTH AND CHARACTERIZATION OF SINGLE CRYSTAL (Cd, Zn)S THIN FILMS RELEVANT TO THE STUDY OF THE (Cd, Zn)S/Cu/SUB x/S PHOTOVOLTAIC CELL Ph.D. Thesis
Barry Lee Chin Aug. 1983 146 p refs
(Contract DE-AC03-76SF-00098)
(DE84-003288; LBL-16117) Avail: NTIS HC A07/MF A01

Single crystal (Cd,Zn)S thin films of varying compositions were deposited by a hot-wall vacuum deposition technique to eliminate the effects of grain boundaries and to provide a planar interface. The heteroepiaxial films were grown on both (111) and off-(111) GaAs and (111) Ge substrates. The deposited films were characterized using X-ray diffraction, SEM-EDAX and Hall mobility measurements. The composition and growth rate depended very strongly upon the ratio of ZnS to CdS evaporated and the substrate surface. Heterojunctions with Cu/sub x/S were formed by both a solid state ion exchange reaction and reactive sputtering. Current voltage characteristics and spectral response data were measured on completed devices. Compositional Auger electron spectroscopy depth profiling was performed on heterojunctions using both processes for forming the Cu/sub x/S layer. A sharp interface was found for the reactively sputtered Cu/sub x/S/II-VI heterojunction whereas a diffuse interface existed for the ion exchange formed Cu/sub x/S. Relative sensitivity factors were calculated using fixed compositions and sulfur as the standard. DOE

N84-21386# Sandia Labs., Albuquerque, N. Mex.
AC CONDUCTIVITY OF POLYCRYSTALLINE Ca-ALPHA-DOUBLE PRIME-ALUMINA
Eric E. Hellstrom 1983 15 p refs Presented at the Electrochem. Soc. Fall Meeting, Washington, D.C., 9 Oct. 1983
(Contract DE-AC04-76DP-00789)
(DE84-005529; SAND-83-2655C; CONF-831086-11) Avail: NTIS HC A02/MF A01

Polycrystalline Ca-"-alumina was prepared from Na-"-alumina by molten salt exchange in Ca(NO3)2-CaCl2 and in CaCl2. CaO6Al2O3 did not form during the exchange processes. CaCl2 attacks the polycrystalline "-alumina. AC conductivity data on the polycrystalline material were fitted to an equivalent circuit using a nonlinear least squared error fitting program, from which the Ca ion conductivity was extracted. The bulk Ca ion conductivity is 1/0.0003 ohm cm at 3000C. Intergranular resistance is thought to dominate the overall Ca ion resistance. DOE

N84-21387# Texas Technological Univ., Lubbock. Dept. of Electrical Engineering.
DEEP TRAPS IN AlGaAs LAYERS AT AlGaAs-GaAs INTERFACES Final Technical Report
William M. Portnoy 1 Oct. 1983 14 p refs
(Grant DE-FG02-80CS-83106)
(DE84-005234; DOE/CS-83106/T1) Avail: NTIS HC A02/MF A01

Deep trapping levels in the AlGaAs layer near the AlGaAs-GaAs interface are characterized using deep level transient spectroscopy, thermally stimulated capacitance measurements, forward current-voltage characteristics, and capacitance vs. reverse-bias voltage taken at different temperatures. DOE

N84-21388# Cincinnati Univ., Ohio.
INELASTIC STRONG INTERACTIONS AT HIGH ENERGIES Annual Progress Report, 1 Jun. 1983 - 1 May 1984
Peter Suranyi 1984 7 p refs
(Contract DE-AC02-76ER-02978)
(DE84-005666; DOE/ER-02978/10) Avail: NTIS HC A02/MF A01

Various methods giving increasingly more precise, but physically equivalent results were introduced for the investigation of U(1) lattice theories. The mass gap and string tension were calculated and deconfining phase transition points were estimated in Hamiltonian lattice theories by employing the variational and WKB methods and by constructing periodic Gaussian models. At weak coupling U(1) lattice theories (global or gauge) of d-dimension were shown to be equivalent to Z (integer valued) or Z(2) spin theories of d-1 dimensions. A systematic method for performing dimensional reduction on theories constructed in (D+n)-dimensional spacetimes, with or without torsion, which admit n Killing vectors was developed. For the case of n abelian Killing vectors the field contents and their equations of motion for the corresponding (d+n)-dimensional theories were completely worked out. An extended conformal theory of gravity was constructed and its local symmetries were compared to those of Einstein and Weyl. The extension to superspace was also studied. DOE

N84-21389# Northeastern Univ., Boston, Mass. Dept. of Physics.
DYNAMICAL THRESHOLD BEHAVIOR OF A SLIDING CHARGE DENSITY WAVE
J. B. Sokoloff 1983 14 p refs
(Contract DE-AC02-81ER-10866)
(DE84-004304; DOE/ER-10866/T3) Avail: NTIS HC A02/MF A01

The existence of a dynamical threshold field [i.e., the value of the electric field such as when the applied field is reduced to this value the charge density wave (CDW) stops sliding] requires that the sliding of the CDW at low center of mass velocities occur as local sudden jumping motion reminiscent of stick-slip friction. DOE

N84-21390# Sandia Labs., Albuquerque, N. Mex.
STRUCTURAL PHASE TRANSITIONS AT HIGH PRESSURE: QUANTUM EFFECTS
G. A. Samara 1984 8 p refs Presented at the Intern. Symp. on Solid State Phys. Under Pressure, Izu-Nagaoka, Japan, 18 Jan. 1984
(Contract DE-AC04-76DP-00789)
(DE84-005724; SAND-83-25679C; CONF-840140-1) Avail: NTIS HC A02/MF A01

Pressure is an excellent variable to study the manifestation of quantum fluctuations in the properties of phase transitions in ferroelectrics and antiferroelectrics. Results on pure crystals agree with theory; however, results on mixed KTa/ sub 1-x/Nb/sub x/O3 crystals with x less than or equal to 0.02 show departure from theory. The pressure results provide an explanation for these departures and shed new light on the nature of the transition in these materials. DOE

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N84-21391# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

JOURNAL OF ENGINEERING THERMOPHYSICS (SELECTED ARTICLES)
Ge Minglong and Fang Zhaokui 5 Jan. 1984 23 p Transl. into ENGLISH from Gongcheng Rewuli Xuebao (China), v. 3, no. 4, Nov. 1982 p 323-329, 330-333
(AD-A137191; FTD-ID(RS)T-1748-83) Avail: NTIS HC A02/MF A01 CSCL 20/13

One isentropic reference line and two isenthalpic partial derivatives are used to establish extrapolation formulas of rocket engine performance parameters. These formulas can be used for the extrapolation calculations of specific thrust, characteristic velocity, nozzle-area ratio and the thermodynamic parameters at the combustion chamber and the nozzle exit when there are changes in the initial enthalpy of the propellant, combustion chamber pressure, and nozzle exit pressure. R.J.F.

N84-21392# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
ACHIEVING CHEMICAL ACCURACY BY QUANTUM MONTE CARLO
William A. Lester, Jr. and Peter J. Reynolds Aug. 1983 7 p refs Presented at the Workshop on Energetic Mater. Initiation Fundamentals, Chestertown, Md., 15-17 Aug. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005175; LBL-16954; CONF-8308155-1) Avail: NTIS HC A02/MF A01

In order to better understand the processes resulting in the release of chemical energy, a computational technique of high accuracy is needed. One alternative approach to the current quantum chemistry techniques for molecular studies which holds great promise is the quantum Monte Carlo (QMC) method. With very simple importance functions, 75 to 100% of the correlation energy of two to ten electron molecules (H2, LiH, Li2, H2O) were obtained. Results are presented for the ground-state energy of Li2 at a few different nuclear separations. DOE

N84-21393# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
CHEMICAL APPLICATION OF DIFFUSION QUANTUM MONTE CARLO
Peter J. Reynolds and William A. Lester, Jr. Oct. 1983 18 p refs Presented at the NASA/Goddard-CDC Symp. on Cyber 205 Appl., Lanham, Md., 11-12 Oct. 1983
(Contract DE-AC03-76SF-00098)
(DE84-005173; LBL-16754; CONF-8310246-1) Avail: NTIS HC A02/MF A01

The diffusion quantum Monte Carlo (QMC) method gives a stochastic solution to the Schroedinger equation. As an example the singlet-triplet splitting of the energy of the methylene molecule CH2 is given. The QMC algorithm was implemented on the CYBER 205, first as a direct transcription of the algorithm running on our VAX 11/780, and second by explicitly writing vector code for all loops longer than a crossover length C. The speed of the codes relative to one another as a function of C, and relative to the VAX is discussed. Since CH2 has only eight electrons, most of the loops in this application are fairly short. The longest inner loops run over the set of atomic basis functions. The CPU time dependence obtained versus the number of basis functions is discussed and compared with that obtained from traditional quantum chemistry codes and that obtained from traditional computer architectures. Finally, preliminary work on restructuring the algorithm to compute the separate Monte Carlo realizations in parallel is discussed. DOE

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N84-21394# Office of Naval Research, London (England).
EUROPEAN SCIENTIFIC NOTES, VOLUME 38, NUMBER 2 Monthly Report
Larry E. Shaffer, ed. Feb. 1984 59 p
(AD-A137652; ESN-38-2) Avail: NTIS HC A04/MF A01 CSCL 05/1

European Scientific Notes (ESN) is a monthly publication with brief articles on recent developments in European scientific research. The publication is not intended to be part of the scientific literature. The value of ESN articles to Americans is to call attention to current developments in European science and technology and to the institutions and people responsible for these efforts. The ESN authors are primarily ONRL staff members. Occasionally articles are prepared by or in cooperation with staff members of the USAF European Office of Aerospace Research and Development or the US Army Research and Standardization Group. Qualified US scientists travelling in Europe may also be invited to author an ESN article. Author (GRA)

N84-21395# Naval Postgraduate School, Monterey, Calif.
DECISION THEORY: INDIVIDUAL BIASES AND THEIR EFFECT ON FORECASTING IN AN ORGANIZATION M.S. Thesis
John Timothy Shannon and David Alan Schwiering Dec. 1983 67 p
(AD-A137943) Avail: NTIS HC A04/MF A01 CSCL 05/1

There has been a great deal written about how individual cognitive biases effect decision making. However, there is little empirical evidence to show how such heuristic patterns affect decision making within organizations. This thesis reviews the literature concerning heuristics and behavioral decision theory and then examines budgetary forecasting decisions within two large organizations to see if these biases can be observed in forecasts produced within organizations. Author (GRA)

N84-21396# Department of Energy, Oak Ridge, Tenn. Data Processing Div.
MANAGEMENT OF AEROSPACE CONTRACT DOCUMENTATION BY INDUSTRY AND GOVERNMENT
Edrick G. Coppock 1983 18 p Presented at the NATO Conf. on the Appl. of New Technol. to Improve the Delivery of Aerospace and Defense Inform., Ottawa (Canada), 14-15 Sep. 1983
(DE84-900451; CONF-8309188-1) Avail: NTIS HC A02/MF A01

Methods of documenting and tracking contract requirements and deliverables from the inception of a project through its completion were reviewed. A specific system, the technical information monitoring system is discussed. The tracking of deliverables in the form of technical reporting requirements for research and development contracts are emphasized. The application of new technologies to improve productivity and reduce overlap in energy research and development, to enhance contract documentation, accelerate the dissemination of contractor research and development reports and technical information are outlined. DOE

N84-21397# Oak Ridge National Lab., Tenn.
ORNL TRENDS AND BALANCES, 1984-1989 Annual Report
Jan. 1984 52 p
(Contract W-7405-eng-26)

(DE84-006320; ORNL/PPA-84/1; AR-6) Avail: NTIS HC A04/MF A01

Institutional planning and long range goals are discussed. Topics covered include: history and accomplishments of ORNL; present role; strategic planning; research and development programs; laboratory organizations; nuclear and engineering technology programs; advanced energy systems programs; basic physical sciences programs; biomedical and environmental sciences programs; the Carbide years; and summary resource projections. DOE

N84-21398# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Physical Sciences, Mathematics and Resources.

EVALUATIVE REPORT ON THE NATIONAL ENGINEERING LABORATORY, NATIONAL BUREAU OF STANDARDS, FISCAL YEAR 1983

Dec. 1983 97 p

(Contract NB82-SBCA-1505)

(PB84-129873) Avail: NTIS HC A05/MF A01 CSCL 05A

An evaluation of the technical functions and programs of the National Engineering Laboratory (NEL), one of the major organizational units of the National Bureau of Standards is presented. It represents the work of eight panels. One of the panels is for the NEL as a whole and performs an overview function for the National Research Council. The other seven panels review specific activities within NEL. This volume contains the full text of the reports of all eight panels. Readers should keep in mind that these reports deal with only a part of the total NBS effort. GRA

N84-21416*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

DBMS AS A TOOL FOR PROJECT MANAGEMENT

Henry Linder *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 153-157 (For primary document see N84-21403 11-82)

Avail: NTIS HC A08/MF A01 CSCL 05A

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software.*

N84-21399 Illinois Inst. of Tech., Chicago.

ENHANCING EFFECTIVENESS OF INFORMATION RETRIEVAL SYSTEMS WITH RELATIONAL THESAURI Ph.D. Thesis

Yih-Chen Wang 1983 113 p

Avail: Univ. Microfilms Order No. DA8400842

Much work has been done to improve the performance of information retrieval systems using thesauri to supplement the index terms in the original request with associated terms. The term classification methods proposed in the past are heavily dependent on the document collection, which is not a staple context and can change rapidly. Furthermore, the complexities of these classified methods make maintenance of the matrices expensive. This thesis describes the design and development of a new type of thesaurus based on lexical semantic relations. Lexical semantic relations have been defined, investigated, and used in various disciplines. Relational thesauri have been constructed to perform a new type of term classification. The relational thesauri are generally applicable to any document collection and their maintenance is relatively simple. A series of experiments to evaluate thesauri of this new type have been run on an information retrieval system called IRS at Illinois Institute of Technology. Dissert. Abstr.

N84-21400 Pittsburgh Univ., Pa.

INTEGRITY IN DATABASE SYSTEMS Ph.D. Thesis

Leszek Tadeusz Lilien 1983 183 p

Avail: Univ. Microfilms Order No. DA8327622

Acceptable data and continuous access to it are essential elements of a reliable centralized or distributed database system. A theoretical analysis of two criteria for database acceptability, transaction-consistency and integrity, gives two major results. First, it shows that verification of transaction-consistency of a given database state is NP-complete. In contrast, verification of integrity can be performed in time linear in the number of integrity assertions that are to be evaluated. This result justifies use of integrity as a practical criterion of database acceptability. Second, the analysis indicates that database recovery after a system crash can be done in polynomial time under the condition that a logical system log exists and a past database state is the goal of recovery (such a recovery is termed backward). In contrast, other classes of recovery methods are NP-hard/complete. This result justifies use of logs for database recovery. Performance analysis of these three methods indicates that compile-time validation minimizes the number of accesses to the secondary storage for serially executed transactions. Dissert. Abstr.

N84-21401 Columbia Univ., New York.

WORD FREQUENCY AND AUTOMATIC INDEXING Ph.D. Thesis

Bella Hass Weinberg 1983 233 p

Avail: Univ. Microfilms Order No. DA8327316

The discovery that word frequency in natural language yields a predictable graph stimulated research in many fields. Several linguists have stated that the phenomenon is irrelevant to content analysis; however, information scientists have used word frequency to automatically extract content indicators or index terms from texts. The major methods of statistically based automatic indexing include: designating a level of frequency in a text as the carrier of the content indicators; assigning high weight to words that occur in the fewest documents in a collection; and computing deviation from expected frequency, which gives high value to terms that occur more frequently in one document than in a collection or general English. This study tested whether human indexing is characterizing by any of these algorithms by examining the level of frequency of index terms in individual texts and in a cumulative sort of those texts. Sixty-five articles and their abstracts from the Proceedings of the American Society of Civil Engineers and four sets of indexing (including author indexing) constituted the raw data. Dissert. Abstr.

N84-21402# RAND Corp., Santa Monica, Calif.

INFORMATION SYSTEMS, SECURITY AND PRIVACY

Willis H. Ware Nov. 1983 20 p refs Presented at Subcomm. on Transportation, Aviation and Mater., Comm. on Sci. and Technology, U.S. House of Representatives, Washington, D.C., 24 Oct. 1983

(RAND/P-6930) Avail: NTIS HC A02/MF A01

A brief overview concerning the security of information and computer systems was presented and the relationship between security and personal privacy was examined. Record keeping privacy concerns protecting personal information and controlling its use for authorized purposes. Computer security provides protective mechanisms that assure computer system safety and protect the stored information including access to that information. Defense environment security was contrasted with commercial security. Threats against Department of Defense security involve large technical and financial resources of major world powers while the industrial threat is comparatively minor and involves authorized individuals using the system for personal gain. Several suggestions for the improvement of security for computer software and the related systems are presented, including preparation of a standard government handbook listing preferred procedures for running a computer center, clarification of personal privacy laws, and vendor obligations regarding security safeguards. M.A.C.

N84-21403*# National Aeronautics and Space Administration, Washington, D. C.

NASA ADMINISTRATIVE DATA BASE MANAGEMENT SYSTEMS, 1983

James D. Radosevich, ed. Apr. 1984 174 p refs Conf. held in Greenbelt, Md., 25-26 May 1983
(NASA-CP-2304; NAS 1.55:2304; Rept-2) Avail: NTIS HC A08/MF A01 CSCL 05B

Technical and management problems associated with the evaluation, selection, installation, and use of data base management system packages in the NASA administrative support environment are examined. For individual titles, see N84-21404 through N84-21417.

N84-21404*# National Aeronautics and Space Administration, Washington, D. C.
NASA'S EMERGING PRODUCTIVITY PROGRAM
David R. Braunstein *In its* NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 1-8 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

The goals, membership, and organizational structure of the NASA Productivity Steering Committee are described as well as steps taken to make NASA a leader in the development and application of productivity and quality concepts at every level of agency management. The overall strategy for the Productivity Improvement and Quality Enhancement (PIQE) Program is through employee involvement, both civil servant and contractor, in all phases of agency-wide activity. Elements of the PIQE program and initial thrusts are examined. A.R.H.

N84-21405*# National Aeronautics and Space Administration, Washington, D. C.
ACTION INFORMATION MANAGEMENT SYSTEM (AIMS): A USER'S VIEW
Michael Wiskerchen *In its* NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 9-12 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

The initial approach used in establishing a user-defined information system to fulfill the needs of users at NASA Headquarters was unsuccessful in bringing this pilot endeaveor to full project status. The persistance of several users and the full involvement of the Ames Research Center were the ingredients needed to make the AIMS project a success. The lesson learned from this effort is that NASA should always work from its organizational strengths as a Headquarters-Center partnership. A.R.H.

N84-21406*# National Aeronautics and Space Administration, Washington, D. C.
AUTOMATED RTOP MANAGEMENT SYSTEM
Phyllis Hayes *In its* NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 13-18 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

The structure of NASA's Office of Aeronautics and Space Technology electronic information system network from 1983 to 1985 is illustrated. The RTOP automated system takes advantage of existing hardware, software, and expertise, and provides: (1) computerized cover sheet and resources forms; (2) electronic signature and transmission; (3) a data-based information system; (4) graphics; (5) intercenter communications; (6) management information; and (7) text editing. The system is coordinated with Headquarters efforts in codes R,E, and T. A.R.H.

N84-21407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RAMIS DBMS UPDATE
James Head *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 19-29 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Highlights of a round table discussion of end-user computing, IBM strategies, fourth generation languages, and directions for software innovation are presented as well as observations from an in-depth study of 271 organizations. The RAMIS data base management system is evaluated according to 10 defining criteria for a fourth-generation language: result-oriented programming; common language/demand level adaptability; application extension; user/machine insulation; work station environment; comprehensive software toolkit; integrating perspective on computing and data resources; end user data base capability; accessible dictionaries; and user assistance/facility coordination. A.R.H.

N84-21408*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
INTERCENTER PROBLEM REPORTING AND CORRECTIVE ACTION SYSTEM (PRACAS)
Georgia H. Brock and James J. Paley *In* NASA. Kennedy Space Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 31-54 refs Prepared in cooperation with Computer Sciences Corp., Orlando, Fla. (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

The Kennedy Space Center is transforming the PRACA bath automatic data processing (ADP) system of today into a fully integrated data base with on-line update and retrieval capabilities. The present manual system of reporting (Datafax, mail, and telephone) to the off-site design and engineering organizations is to be replaced by direct access to the most current information as it accrues at KSC or VAFB. Two major goals of the Intercenter PRACA are to provide a single data depository for both launch sites and to fully integrate the problem data with engineering data as well as other relevant information. The resulting ADP system can provide a closed loop system for problem reporting, corrective action and recurrence control that should serve the engineering community as well as reliability and quality assurance at the launch sites, KSC and VAFB, and at the design centers, JSC and MSFC. A.R.H.

N84-21409*# Planning Research Corp., McLean, Va.
INTEGRATING MICRO-COMPUTERS WITH A CENTRALIZED DBMS: ORACLE, SEED AND INGRES
Jerry Hoerger *In* NASA, Washington NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 55-74 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Users of ADABAS, a relational-like data base management system (ADABAS) with its data base programming language (NATURAL) are acquiring microcomputers with hopes of solving their individual word processing, office automation, decision support, and simple data processing problems. As processor speeds, memory sizes, and disk storage capacities increase, individual departments begin to maintain 'their own' data base on 'their own' micro-computer. This situation can adversely affect several of the primary goals set for implementing a centralized DBMS. In order to avoid this potential problem, these microcomputers must be integrated with the centralized DBMS. An easy to use and flexible means for transferring logic data base files between the central data base machine and micro-computers must be provided. Some of the problems encounted in an effort to accomplish this integration and possible solutions are discussed. A.R.H.

N84-21410*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUANTITATIVE EVALUATION OF 3 DBMS: ORACLE, SEED AND INGRES
Regina Sylto *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 75-84 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Characteristics required for NASA scientific data base management application are listed as well as performance testing objectives. Results obtained for the ORACLE, SEED, and INGRES packages are presented in charts. It is concluded that vendor packages can manage 130 megabytes of data at acceptable load and query rates. Performance tests varying data base designs and various data base management system parameters are valuable to applications for choosing packages and critical to

designing effective data bases. An applications productivity increases with the use of data base management system because of enhanced capabilities such as a screen formatter, a reporter writer, and a data dictionary. A.R.H.

N84-21411*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AUTOMATED ADMINISTRATIVE DATA BASES
Michele D. Marrie, Joyce R. Jarrett, Susan A. Reising, and John E. Hodge *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 85-98 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Improved productivity and more effective response to information requirements for internal management, NASA Centers, and Headquarters resulted from using automated techniques. Modules developed to provide information on manpower, RTOPS, full time equivalency, and physical space reduced duplication, increased communication, and saved time. There is potential for greater savings by sharing and integrating with those who have the same requirements. A.R.H.

N84-21412*# Maryland Univ., College Park. Dept. of Computer Science.
METHOD FOR ACCESSING DISTRIBUTED HETEROGENEOUS DATABASES
Barry E. Jacobs *In* NASA, Washington NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 89-104 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

A scenario of relational, hierarchial, and network data bases is presented and a distributed access view integrated data base system (DAVID) is described for uniformly accessing data bases which are heterogeneous and physically distributed. The DAVID system is based on data base logic so that the relational approach is generalized to the heterogeneous approach. The global data manager is explained as are global data manipulation languages which can operate on all the data bases and can query the data dictionary and the data directory. A.R.H.

N84-21413*# National Aeronautics and Space Administration, Washington, D. C.
NASA SCIENTIFIC AND TECHNICAL INFORMATION SYSTEM (STI) AND NEW DIRECTORY OF NUMERICAL DATA BASES
John Wilson *In its* NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 105-120 (For primary document see N84-21403 11-82)
Avail: NTIS HC A02/MF A01 CSCL 05B

The heart of NASA's STI system is a collection of scientific and technical information gathered from worldwide sources. Currently containing over 2.2 million items, the data base is growing at the rate of 140,000 items per year. In addition to announcement journals, information is disseminated through the NASA RECON on-line bibliographic search system. One part of RECON is NALNET which lists journals and books held by the NASA Centers. Another service now accessible by recon is a directory of numerical data bases (DND) which can be shared by NASA staff and contractors. The DND describes each data base and gives the name and phone number of a contact person. A NASA-wide integrated library system is being developed for the Center libraries which will include on-line catalog and subsystems for acquisition, circulation control, information retrieveal, management information, and an authority file. These subsystems can interact with on-line bibliographic, patron, and vendor files. A.R.H.

N84-21414*# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
SPECIFICATIONS FOR A FEDERAL INFORMATION PROCESSING STANDARD DATA DICTIONARY SYSTEM
Alan Goldfine *In* NASA, Washington NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 121-144 refs (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

The development of a software specification that Federal agencies may use in evaluating and selecting data dictionary systems (DDS) is discussed. To supply the flexibility needed by widely different applications and environments in the Federal Government, the Federal Information Processing Standard (FIPS) specifies a core DDS together with an optimal set of modules. The focus and status of the development project are described. Functional specifications for the FIPS DDS are examined for the dictionary, the dictionary schema, and the dictionary processing system. The DDS user interfaces and DDS software interfaces are discussed as well as dictionary administration. A.R.H.

N84-21415*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NASA-WIDE STANDARD ADMINISTRATIVE SYSTEMS
Paul Schneck *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 145-152 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Factors to be considered in developing agency-wide standard administrative systems for NASA include uniformity of hardware and software; centralization vs. decentralization; risk exposure; and models for software development. A.R.H.

N84-21416*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DBMS AS A TOOL FOR PROJECT MANAGEMENT **c81**
Henry Linder *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 153-157 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05A

Scientific objectives of crustal dynamics are listed as well as the contents of the centralized data information system for the crustal dynamics project. The system provides for project observation schedules, gives project configuration control information and project site information. A.R.H.

N84-21417*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
USE OF DBMS IN MULTI-STEP INFORMATION SYSTEMS FOR LANDSAT
Carey E. Noll *In* NASA. Goddard Space Flight Center NASA Admin. Data Base Management Systems, 1983 Apr. 1984 p 159-167 (For primary document see N84-21403 11-82)
Avail: NTIS HC A08/MF A01 CSCL 05B

Data are obtained by the thematic mapper on LANDSAT 4 in seven bands and are telemetered and electronically recorded at ground station where the data must be geometrically and rediometrically corrected before a photographic image is produced. Current system characteristics for processing this information are described including the menu for data products reports. The tracking system provides up-to-date and complete information and requires that production stages adhere to the inherent DBMS structure. The concept can be applied to any procedures requiring status information. A.R.H.

N84-21418*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
DEVELOPMENT OF A DATA MANAGEMENT FRONT-END FOR USE WITH A LANDSAT-BASED INFORMATION SYSTEM Final Report, Feb. - Dec. 1982
Brian J. Turner Dec. 1982 42 p
(Contract NAS5-26468)
(NASA-CR-175151; NAS 1.26:175151) Avail: NTIS HC A03/MF A01 CSCL 05B

The development and implementation of a data management front-end system for use with a LANDSAT based information system that facilitates the processsing of both LANDSAT and ancillary data was examined. The final tasks, reported on here, involved; (1) the implementation of the VICAR image processing software system at Penn State and the development of a user-friendly front-end for this system; (2) the implementation of JPL-developed software based on VICAR, for mosaicking LANDSAT scenes;

(3) the creation and storage of a mosiac of 1981 summer LANDSAT data for the entire state of Pennsylvania; (4) demonstrations of the defoliation assessment procedure for Perry and Centre Counties, and presentation of the results at the 1982 National Gypsy Moth Review Meeting, and (5) the training of Pennsylvania Bureau of Forestry personnel in the use of the defoliation analysis system. M.A.C.

N84-21419# Office of the Chief of Staff (Army), Washington, D.C.
WHERE TO FIND IT. INFORMATION RESOURCE CENTERS, A QUICK REFERENCE BOOKLET
Gloria Brown Sep. 1983 27 p
(AD-A133117) Avail: NTIS HC A03/MF A01 CSCL 05/2

The basic purpose of this document is to provide a quick source of reference to the various analytical, contracting and study communities. The information contained is condensed and easily accessible. Author (GRA)

N84-21420# Stanford Univ., Calif. Applied Mathematics Group.
[BIBLIOGRAPHY AND ABSTRACTS OF PAPERS PERTAINING TO APPLIED MATHEMATICS] Progress Report, 1 Sep. 1982 - 30 Apr. 1983
J. B. Keller 30 Apr. 1983 15 p
(Grant AF-AFOSR-0134-79; AF Proj. 2304)
(AD-A137823; AFOSR-84-0034TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

This document includes a bibliography and abstracts of eleven papers pertaining to applied mathematics. GRA

N84-21421# Ohio State Univ., Columbus. Dept. of Computer and Information Science.
DISTRIBUTED KNOWLEDGE BASE SYSTEMS FOR DIAGNOSIS AND INFORMATION RETRIEVAL Annual Report, 1 Jul. 1982 - 30 Jul. 1983
B. Chandrasekaran Nov. 1983 116 p
(Grant AF-AFOSR-0255-82; AF Proj. 2304)
(AD-A137828; AFOSR-84-0039TR) Avail: NTIS HC A06/MF A01 CSCL 09/4

During the year, progress was made in a number of directions: A better understanding of different types of problem solving that underlie expert reasoning was obtained; Advances in representing design knowledge as plans in design specialists were made. CRSL, the language for diagnostic expert system building that was designed in the author's laboratory, was applied to the implementation of a diagnostic system for the fuel system of an automobile and directions for new constructs for the language were obtained; A representation for functional understanding of how a device works was obtained, and methods of automatically generating diagnostic expert systems from this representation of a device were also obtained; and An analysis of how techniques and tasks can be matched in expert design was undertaken. GRA

N84-21422# Stanford Univ., Calif. Dept. of Mathematics.
[RESEARCH ACTIVITIES OF THE APPLIED MATHEMATICS GROUP] Progress Report, 1 Jan. - 30 Sep. 1983
J. B. Keller 30 Sep. 1983 12 p
(Grant AF-AFOSR-0134-79; AF Proj. 2304)
(AD-A137838; AFOSR-84-0033TR) Avail: NTIS HC A02/MF A01 CSCL 05/2

The research activities of the Applied Mathematics Group during the first nine months of 1983 are described in this report. A brief outline of the research is presented. This is followed by a list of publication status of the work, and the abstracts of papers submitted for publication during this period. Author (GRA)

N84-21423# Los Alamos Scientific Lab., N. Mex.
EXPERIMENT IN BENCHMARKING DATABASE SYSTEMS
Ronald Martinez, Richard Wiley, Dina Bitton (Cornell Univ.), and Carolyn Turbyfill (Cornell Univ.) 1983 7 p refs Presented at the US Fall DECUS Symp., Las Vegas, Nev., 24-28 Oct. 1983
(Contract W-7405-eng-36)
(DE84-003840; LA-UR-83-3395; CONF-8310182-8) Avail: NTIS HC A02/MF A01

An interactive benchmark of the INGRES database system, is described. The benchmark includes single user runs and an extensive set of multiuser runs composed by synthesizing workloads of increasing complexity. Basic estimates were obtained for the response type of a range of interactive queries and for several other measures of the database management system performance. DOE

N84-21424# National Library of Medicine, Bethesda, Md. Bibliographic Services Div.
MEDLARS INDEXING INSTRUCTIONS, TUMAR KEY SUPPLEMENT, 1984 (TECHNICAL NOTES)
Thelma Charen 1983 51 p refs
(PB84-120039; NLM-MED-83-09) Avail: NTIS HC A04/MF A01 CSCL 05B

The indexing guide, designed primarily for MEDLARS indexers and searchers, is intended as a guide to the correct MeSH (Medical Subject Heading) term for various histological types of tumor and cancer. This Supplement to Technical Notes was a revision of the 1975 Tumor Key to bring it up to date with the 1984 Medical Subject Headings (MeSH) and the International Classification of Diseases for Oncology (ICD-O). GRA

N84-21425# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE APPLICATION OF NEW TECHNOLOGIES TO IMPROVE THE DELIVERY OF AEROSPACE AND DEFENCE INFORMATION
Loughton, England Dec. 1983 110 p refs Meeting held in Ottawa, 14-15 Sep.1983
(AGARD-CP-357; ISBN-92-835-0345-7) Avail: NTIS HC A06/MF A01

The pace of development of new technologies in communication networks and information delivery systems was extremely rapid over recent years. These developments and the ways in which they are applied to increase the effectiveness of managers, engineers and scientists are reviewed. Attention was directed particularly to the interconnecting of data bases and information centers within communication systems that permit the retrieval and post processing by end-users. Ways and means by which intelligent terminals, micro and mini computers are used in the actual aggregation and post-processing of data information were examined. Example of how the new technologies increase the productivity of scientists and engineers to improve the decision making capabilities of program managers were provided. For individual titles, see N84-21426 through N84-21436.

N84-21426# Oak Ridge National Lab., Tenn. Computer Sciences.
OPEN SYSTEMS INTERCONNECTION FOR THE DEFENCE COMMUNITY
N. B. Gove *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 5 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

The area of Open Systems Interconnection is a very active area. The concept of a layered approach to communication standards is generally accepted and the OSI Reference Model appears to be successful as a working aproach toward integration of the many standards involved in open connection. The Reference Model is not in itself a communication standard but rather a framework for standards development. As such, it will permit evolution of standards as needed in a changing technology, while providing a coherent approach to the many problems involved in Open Systems interconnection. Author

N84-21427# National Research Council of Canada, Ottawa (Ontario). Automated Systems and Networks.
THE INET GATEWAY TRIAL
P. H. Wolters *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 11 p refs (For primary document see N84-21425 11-82)

Copyright. Avail: NTIS HC A06/MF A01

The iNet Gateway is an intelligent network concept developed by the Computer Communications Group (CCG) of the TransCanada Telephone System (TCTS). iNet has evolved in recognition of the requirement for more universal accessibility to information providers and other computer based service. The iNet Gateway is designed to simplify the process of gathering, using and communicating information by offering a sngle point of access to satisfy the information needs of a user. In order to test the concept of intelligent networking a one year field trial is being conducted. The purpose of the trial is to provide the business and information communities with a single point of access to a great variety of computer systems including international, national and local networks as well as offline services provided by information specialists or intermediaries. The trial is expected to further define the requirements for value-added network services. Author

N84-21428# Telsystemes Questel, Paris (France).
SHARING COMMAND LANGUAGES AND SOFTWARE
Pierre Buffet *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 5 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

One of the first sevices available through the computer was that of selective disemination of information (SDI). Then, late in the sixties, two major technical host computers- namely LIS, (LOCKHEED Information Services) from LMSC. (LOCKHEED Missile and Space Company) and ORBIT Search Service from SDC (System Development Corporation) appeared in the United States. One host computer was installed in Europe in the context of ESRO (the European Space Reseach Orgaization,) because of the relationships of this organization with the NASA. At this time, a user, librarian or information scientists, had to learn two languages, RECON and ORBIT, to access the major international data bases, in particular in Engineering and related disciplines. Later, new vendors gave worldwide online access to new files, e.g., BRS (Bibliograhic Retrieval Services) in the States, and the Europe, representing ten online services, offering access to hundreds of databases. Some solutions for simplifying this access in terms of command languages are explored. The concept of portable software also is examined, as providing the opportunity to share the same language on various computers. Author

N84-21429# Office of the Secretary of Defense, Washington, D.C. Plans and Resources Div.
WORD PROCESSORS IN AEROSPACE/DEFENSE INFORMATION SERVICES: USE OF DISTRIBUTED INFORMATION SYSTEMS BY THE OFFICE OF THE SECRETARY OF DEFENSE
Joseph M. Powers *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 5 p (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

The utilization of word processing and distributed information systems within the Office of the Secretary of Defense (OSD) are described. The OSD is the principal management staff of the Secretary in the exercise of: policy definition, planning, resource management, program evaluation, and fiscal evaluation. Thus, there are in fact certain general management functions that agree common to both OSD and to many civilian industrial organizations. The real common denominator in the management of both military and industrial programs, however, is information - information that is accurate, up-to-date, specific, yet comprehensive - information that is needed to assess and evaluate programs and to make better, more informed decisions. Author

N84-21430# National Research Council of Canada, Ottawa (Ontario).
SCIENTIFIC NUMERIC DATABASES
Gordon H. Wood *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 6 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

Scientific numeric databases (SND) are powerful, relatiely new research tools for the scientific and technical community. Practical examples are used to illustrate their use. The attributes and capabilities of such databases are described and a survey of the activity in this field is given. The SND permit the direct location, retrieval and the subsequent analysis/manipulation of evaluated numeric data. Advances in telecommunications and increases in the number and types of SND produced greatly enhance the likelihood in relevant data being readily available. Although only 5% of all data bases accessible online in North America and Europe are SND, they are growing in importance and acceptance as more databases are developed and scientists and engineers become aware of their potential. The National Research Council of Canada is active not only in the production of SND, involving some international collaboration, but also in the dissemination by means of a nation-wide online packet-switched network. Author

N84-21431# Institut fuer Rundfunktechnik, Munich (West Germany).
GRAPHIC AND VISUAL PRESENTATION OF AEROSPACE DATE
Henning Wilkins *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence IInform. Dec. 1983 7 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

The efficiency of computer-based information retrieval systems is substantially improved by presenting the information subject on a television monitor not only in alphanumeric but also in pictorial form. For systematic retrieval of a specific information, a large information base for alphanumeric and pictorial data must be carefully structured. Special technical equipment for storing and presenting the information must be available, especially when a large number of users will have access to the information base simultaneously. Author

N84-21432# Royal Library of Belgium, Brussels.
THE STANDARDIZATION OF BIBLIOGRAPHIC DATA
Paula C. Goossens *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 9 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

The development of large machine-readable bibliographic data bases, functioning a.o. as union catalogues, is a remarkable step forward in the evolution of the library and information world, Library networks, like all co-operative projects, only efficiently function if the composing parts are constructed according generally accepted norms. The different aspects of the standardization of bibliographic data are discussed. First the bibliographic contents part is handled. Cataloguing rules, the Paris Principles, the ISBD, filing rules and also subject indexing are looked at. Subsequently the more computer oriented aspects are treated, namely the content designation and the physical format structure. These concern the MARC II format, UNIMARC, the UNISIST refeence manual and the CCF. As well the progress made in the library community as in the instrumentation world is surveyed. Finally a pratical application of the standards is presented through the description of NEWWAVE, which is the on-line cataloguing and information retrieval system developed and used at the Royal Library in Brussels. Much important work was realized in the field of the standardization of bibliographic data, but also that some problems are left for the future. Author

N84-21433# Defence Research Information Centre, Orpington (England).
THE APPLICATION OF MANAGEMENT TECHNIQUES TO DEFENCE AND OTHER INFORMATION SERVICES: THE BRITISH APPROACH
G. W. Hart *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 16 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

The Aslib catalog was searched for books, reports, and periodical articles on applications of management techniques to

information services and libraries which were published in Great Britain or written by British authors. Also the last eight years of Aslib Proceedings were searched and an on-line search of the LISA (Library and Information Science Abstracts) files was conducted. A logical approach was made, from planning a new system, through measurement and evaluation, to the application of different technique for improvement of a system, finishing with the more esoteric ones. The aim throughout was to give the flavor of a technique rather than a detailed description. Author

N84-21434# Department of Energy, Oak Ridge, Tenn. Data Processing Div.
MANAGEMENT OF AEROSPACE CONTRACT DOCUMENTATION BY INDUSTRY AND GOVERNMENT
Edrick G. Coppock *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 17 p (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

Method of documenting and tracking contract requirements and deliverables from the inception of a project through its completion are reviewed. One specific system, the Technical Information Monitoring System, is discussed in detail. Emphasis is placed on the tracking of deliverables in the form of technical reporting requirements for research and development contracts for the U.S. Department of Energy. In addition, the application of new technologies to improve productivity and reduce overlap in energy research and development are examined and to enhance contract documentation and accelerate the dissemination of contractor research and development reports and technical information. Author

N84-21435# Stockholm Univ. (Sweden). Computing Centre.
COMPUTER-BASED CONFERENCING
Jacob Palme *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 7 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

Computer conferencing is a more powerful communication medium than electronic mail. The important difference is that computer conferencing provides structing facilities on the data base of text documents, by putting text items into conferences and sub-discussings within a conference. The system has a data base, consisting of a large number of text messages. Each such text message can contain any text written in ordinary human language which the author wants to put there. There are two main kinds of messages: the first, called a letter, is a message from one user to a single or a number of other users. The second type, called a conference entry is stored in one of several computerized conferences. A number of users are members of the computerized conference. Each member normally reads all that is written in the conference and also can freely write messages into the conference, which are then made available to all the other members of the conference. Author

N84-21436# British Library Lending Div., Boston Spa (England).
AUTOMATED DOCUMENT REQUEST AND DELIVERY SYSTEMS IN THE UNITED KINGDOM
Stuart Ede *In* AGARD The Appl. of New Technol. to Improve the Delivery of Aerospace and Defence Inform. Dec. 1983 8 p refs (For primary document see N84-21425 11-82)
Copyright. Avail: NTIS HC A06/MF A01

There are already in use in the UK a variety of methods for the telecommunication of requests: through direct terminal to computer and computer to computer links or via information retrieval database systems. These are described with particular reference to the British Library Lending Division's Automted Request Transmission (ART) services. Possible extensions of these services are also outlined. A rapid document delivery service based on facsimile transmission between British Library sites was in operation for some time, and the results of a pilot service to international users employing more advanced equipment are reported. The increasing provision of satellite links and developments in digital optical recording (DOR) discs and electronic publishing are stimulating the planning of more revolutionary electronic document delivery systems. Factors affecting the provision of such services are discussed as a prelude to a review of a number of UK and European initiatives. Author

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N84-21437*# Terra-Mar, Mountain View, Calif.
ALTERNATIVE STRATEGIES FOR SPACE STATION FINANCING
Donn C. Walklet and A. Tracy Heenan 1 Sep. 1983 33 p refs (Contract NASw-3750)
(NASA-CR-175412; NAS 1.26:175412) Avail: NTIS HC A03/MF A01 CSCL 05C

The attributes of the proposed space station program are oriented toward research activities and technologies which generate long term benefits for mankind. Unless such technologies are deemed of national interest and thus are government funded, they must stand on their own in the market place. Therefore, the objectives of a United States space station should be based on commercial criteria; otherwise, such a project attracts no long term funding. There is encouraging evidence that some potential space station activities should generate revenues from shuttle related projects within the decade. Materials processing concepts as well as remote sensing indicate substantial potential. Futhermore, the economics and thus the commercial feasibility of such projects will be improved by the operating efficiencies available with an ongoing space station program. B.G.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N84-21438# Committee on Public Works and Transportation (U.S. House).
COMPILATION OF SELECTED AVIATION LAWS
Washington GPO Sep. 1983 302 p Presented to the Comm. on Public Works and Transportation, 98th Congr., 1st Sess., Sep. 1983
(GPO-99-811) Avail: Committee on Public Works and Transportation

Contents: Federal Aviation Act of 1958; employee protection provisions of the Airline Deregulation Act of 1978; Airport and Airway Improvement Act of 1982; Airport and Airway Trust Fund; Tax provisions relating to air transportation; Independent Safety Board Act of 1979; Aviation and Safety and Noise Abatement Act of 1979; Acts relating to Washington area airports (1940, 1945, 1950); Government guaranty of loans to air carriers; Acts of 1944 and 1949 relating to surplus airport property; Hazardous Materials Transportation Act; Selected provisions of subtitle 1 of title 49, United States Code; and the International Aviation Facilities Act and International Air Transportation Fair Competitive Practices Act of 1974. A.R.H.

N84-21439# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, AND CERTAIN INDEPENDENT AGENCIES APPROPRIATIONS, 1984, PART 2
Washington GPO 1984 783 p Hearings on H.R. 3133 before the Comm. on Appropriations, 98th Congr., 1st Sess., 14 Apr., 21 Apr., 28 Apr., and 12 May 1983
(S-Rept-98-221-Pt-2; GPO-17-460) Avail: Comm. on Appropriations

Appropriation hearings for the National Science Foundation, the National Aeronautics and Space Administration, Federal Emergency Management Agency, Neighborhood Reinvestment Corporation, and Department of Housing and Urban Development-

Independent Agencies are presented. For individual titles, see N84-21440 through N84-21440.

N84-21440# Committee on Appropriations (U. S. Senate).
DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT-INDEPENDENT AGENCIES APPROPRIATIONS FOR 1984: NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
In its Dept. of Housing and Urban Develop., and Certain Independent Agencies Appropriations, 1984, Pt. 2 1984 p 1133-1387 (For primary document see N84-21439 11-84)
Avail: Comm. on Appropriations

Research and development activities in the areas of space transportation systems, space stations, space scence, technology utilization, aeronautical research and technology, space research, energy technology, space tracking and data systems and construction of facilities are summarized. Achievements of the past year were also summarized. B.G.

N84-21441# Committee on Science and Technology (U. S. House).
AUTHORIZING APPROPRIATIONS TO THE NATIONAL AERONAUTICS AND SPACE ADMINISTRATION FOR FISCAL YEAR 1985
Washington GPO 1984 222 p Presented in accompaniment to H.R. 5154 to the Comm. on Sci. and Technol., 98th Congr., 2d Sess., 21 Mar. 1984
(H-Rept-98-629; GPO-31-451) Avail: US Capitol, House Document Room

The Committee on Science and Technology recommends passage of the funding appropriations bill to NASA for research and development, space flight, control and data communications, construction of facilities, and program management. Principal areas of activity in space transportation capability relate to Spacelab, high altitude satellite orbit placement, payload operations, and advanced programs study and evaluation. The completion of the fleet of shuttle orbiters along with mission preparation and control contribute to the fulfillment of the Space Transportation System. The advanced systems program performs studies and aids development of improved capabilities in tracking and data systems for new missions and to improve cost effectiveness and reliability for overall support of the spaceflight missions. The research and program management appropriation funds the performance and management of research, technology, and test activities at NASA installations along with the planning, and support of contractor research and development in aeronautical and space research. M.A.C.

N84-21442# Committee on Science and Technology (U. S. House).
REVIEW OF THE NATIONAL AERONAUTICS AND SPACE ACT OF 1958
Washington GPO 1984 410 p Hearings before the Subcomm. on Space Sci. and Appl. of the Comm. on Sci. and Technol., 98th Congr., 1st Sess., 18, 19, 25, 26 Oct. 1983
(GPO-28-915) Avail: Subcommittee on Space Science and Applications

Whether the policy objectives contained in the National Aeronautics and Space Act of 1958 adequately reflect the direction and scope of NASA's future is explored including whether NASA's ability to keep pace with changes in the space program is in any way limited by the agency's charter. Major trends which are significantly changing the nature of the civilian space program discussed include space commercialization, increased emphasis on national security, and international cooperation and competition. A.R.H.

N84-21443# Committee on Commerce, Science, and Transportation (U. S. Senate).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1985
Washington GPO 1984 21 p H.R. 5154 enacted into law by the 92nd Congr., 2d Sess., 28 Mar. 1984
Avail: US Capitol, House Document Room

Appropriations to the National Aeronautics and Space Administration for research and development, space flight, control and data communications, construction of facilities, and research and program management, and for other purposes are authorized. The provisions of the bill are presented. S.L.

N84-21444# Committee on Science and Technology (U. S. House).
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION AUTHORIZATION ACT, 1985
Washington GPO 1984 22 p A bill, H.R. 5154, referred to the Comm. on Sci. and Technol., 98th Congr., 2d Sess., 15 Mar. 1984
(H-Rept-98-629) Avail: US Capitol, House Document Room

Appropriations are authorized to the National Aeronautics and Space Administratin for research and development, space flight, control and data communications, construction of facilities, and research and program management, and for other purposes. The provisions of the bill are presented. S.L.

85 URBAN TECHNOLOGY AND TRANSPORTATION

includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

N84-21445*# United Technologies Research Center, East Hartford, Conn.
EXTENSION TO AN ANALYSIS OF TURBULENT SWIRLING COMPRESSIBLE FLOW FOR APPLICATION TO AXISYMMETRIC SMALL GAS TURBINE DUCTS Final Report, Nov. 1980 - Nov. 1981
O. L. Anderson, G. B. Hankins, and D. E. Edwards Dec. 1981 69 p refs
(Contracts DEN3-235; DE-AI01-77CS-51040)
(NASA-CR-165597; NAS 1.26:165597; R81-915395-12; DOE/NASA/0235-1) Avail: NTIS HC A04/MF A01 CSCL 13F

An existing computer program, the Axisymmetric Diffuser Duct Code (ADD code), which calculates compressible turbulent swirling flow through axisymmetric ducts was modified to permit calculation of flows through small gas turbine ducts with struts, guide vanes and large degrees of turning. The improvements include a coordinate generator, an end-wall loss model, and a generalized geometry capability to describe struts and guide vanes in ducts which turn more than 90 degrees. An improved output format was developed to provide the solution on any arbitrary plane in the duct and an extensive literature survey of calculation procedures used in gas turbine technology was completed which suggests improvements in the computer code. Calculations are presented for the flow through the AGT101 small gas turbine inlet duct and turbine exhaust diffuser which demonstrate the ADD code modifications implemented in the investigation. The computed results compare favorably with experimental results. S.L.

N84-21446# Booz-Allen and Hamilton, Inc., Bethesda, Md.
INVESTIGATION OF THE APPLICABILITY OF A STORED HYDRAULIC ENERGY PROPULSION SYSTEM TO A CONVENTIONAL BUS Final Report, Aug. 1980 - Aug. 1983
Sep. 1983 134 p refs Sponsored by Urban Mass Transportation Administration and Tri-County Metropolitan Transportation District of Oregon
(PB84-115021; UMTA-OR-06-0007-83-1) Avail: NTIS HC A07/MF A01 CSCL 13F

The objective of this investigation was to determine the feasibility of using stored energy hydraulic propulsion (SHEP) technology in current transit buses, and to present an evaluation of the fuel savings and economic cost/benefits of the SHEP systems that are currently in the concept and hardware stages of development for transit coaches. The analysis included a determination of the current status of SHEP systems proposed or

developed anywhere in the world. The costs and benefits resulting from the operation of the proposed systems were analyzed from actual and computer projected data using a transit coach computer simulation model. This report includes a description of the computer simulation model and an extensive list of references pertinent to the report subject, as well as numerous charts depicting transmission sytems, drive systems, and other hydraulic stored energy projection systems. GRA

88 SPACE SCIENCES (GENERAL)

N84-21447*# Iowa State Univ. of Science and Technology, Ames. Dept. of Physics and Astronomy.
RESEARCH IN SPACE PHYSICS AT THE UNIVERSITY OF IOWA, 1982 Annual Report
James A. VanAllen, Louis A. Frank, Donald A. Gurnett, Stanley D. Shawhan, Evelyn D. Robison, and Thomas D. Robertson Jul. 1983 60 p refs Sponsored in part by NASA, National Science Foundation and the Navy
(NASA-CR-175411; NAS 1.26:175411) Avail: NTIS HC A04/MF A01 CSCL 03B

The energetic particles and the electric, magnetic, and electromagnetic fields associated with the Earth, the Sun, the Moon, the planets, comets, and the interplanetary medium are examined. Matters under current investigation are following: energetic particles trapped in the Earth's magnetic field, origin and propagation of very low frequency radio waves and electrostatic, the magnetospheres of Jupiter, Saturn and prospectively Uranus and Neptune, diffusion of energetic particles in Saturn's magnetosphere, radio emissions from Jupiter and Saturn, solar modulation and the heliocentric radial dependence of the intensity of galactic cosmic rays, interplanetary propagation and acceleration of energetic particles, the theory of wave phenomena in turbulent plasmas, and basic wave-particle-chemical processes in the ionospheric plasma. B.G.

N84-21448*# Lunar and Planetary Inst., Houston, Tex.
FIFTEENTH LUNAR AND PLANETARY SCIENCE CONFERENCE. PRESS ABSTRACTS
1984 65 p refs Conf. held 12-16 Mar. 1984
(NASA-CR-175409; NAS 1.26:175409; LSI-Contrib-526) Avail: SOD CSCL 03B

The origin of the Moon; the evolution of meteorites and KREEP; and the formation of chondrules are discussed. Sonar imagery of volcanic seamounts and volcanism and rifts on Mars and Venus are examined as well as the effect of cosmic ray irradiation on meteorites. For individual titles, see N84-21449 through N84-21464.

N84-21449*# Lunar and Planetary Inst., Houston, Tex.
COSMIC RAY EXPOSURE OF SNC METEORITES AND CONSTRAINTS ON THEIR DERIVATION FROM MARS c93
D. D. Bogard, P. Johnson, and L. E. Nyquist *In* Lunar Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 1-4 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

There is chemical, mineralogical, and isotopic evidence that several rare meteorites originated from the planet Mars. The eight specimens (4 sphergottites, 3 nakhlites, and 1 chassignite) possess a variety of characteristics that suggest a mutual relationship. It can be predicted with reasonable confidence that these SNC meteorites were exposed to cosmic rays at relatively shallow depths for three distinct periods of time during the past approximately 10 million years. Within the context of a Martian origin, this implies that either relatively large objects were ejected from Mars at a common time and underwent three disruptive events in space or that three ejection events occurred within the past approximately 10 million years on restricted segments of Martian terrain with 1300 million year-old rocks. If mechanisms can be identified which satisfy the geochemical properties of SNC meteorites, as well as their cosmic ray exposure, and dynamical problems associated with ejection out of a large gravity field, then the case for the SNC meteorites being samples of Mars can become stronger. A.R.H.

N84-21450*# National Astronomy and Ionosphere Center, Arecibo, Puerto Rico.
VOLCANISM AND RIFT FORMATION IN BETA REGIO, VENUS: NEW RADAR RESULTS c91
D. B. Campbell, J. W. Head (Brown Univ.), J. K. Harmon, and A. A. Hine *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 8-9 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

A high-resolution (approximately 2 km) image of Beta Regio, Venus, obtained with the Arecibo radar system, reveals additional details of its structure which seem to confirm past suggestions that this region consists of a rift system and associated volcanism. Numerous long linear features approximately parallel to the north-south trending trough discovered by the Pioneer-Venus Orbiter are interpreted as being indicative of extensive faulting and the detail for the radar reflectivity anomaly coincident with Theia Mons suggests that it is a major volcano situated on what would be the western bounding fault of the rift system. A.R.H.

N84-21451*# State Univ. of New York, Albany. Dept. of Geological Sciences.
ORIGIN OF THE MOON: IN SEARCH OF THE HOLY GRAIL c91
J. W. Delano *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 8-9 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The Moon's origin could be deduced with certainty if its bulk chemistry were known. However, determination of this chemistry is difficult because of the profound and complex redistribution of elements that occurred in the outer portions of the Moon during crystallization of the magma ocean. The compositions of 23 varieties of volcanic glass, erupted from depths approaching 300 miles, were used to predict the chemistry of a special glass (genesis glass) having a direct link to primordial lunar matter. A sample of glass with the predicted composition was discovered. This allows a new estimate to be made of the Moon's bulk composition. The data indicate that the Moon shares some intriguing chemical similarities with the Earth's mantle. Both genesis glass and lunar gas are furnishing definitive data on the Moon's composition and origin. A.R.H.

N84-21452*# Hawaii Univ., Honolulu. Inst. of Geophysics.
SEAMARC 2 SIDE-SCAN IMAGES OF SUBMARINE VOLCANOES: POTENTIAL ANALOGUES FOR VENUS c46
P. Fryer, D. Hussong, and P. J. Mouginis-Mark *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 10-15 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 08K

The Earth's surface beneath the oceans may be very similar, in terms of ambient pressures, to the surface of Venus. For that reason it is particularly important for geologists studying the surface of Venus to understand the processes which form features on the floors of the oceans. With the SeaMARC 2 seafloor mapping system, it is possible to view a swath of seafloor that is 10 km wide (about 6.2 mi). Side scan images of the Mariana region show that volcanoes of the island arc are more complicated than previously realized and that features of the fore-arc region, which resemble volcanoes morphologically, may result from processes other than volcanism. By comparing data obtained from the ocean floor with radar images of Venus, the geological evolution of that planet may be more fully understood. A.R.H.

N84-21453*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
VENUS: GLOBAL RADAR PROPERTIES IN A GEOLOGICAL

CONTEXT c91
James B. Garvin *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 16-19 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The radar altimetry, roughness (RMS slopes), and reflectivity data acquired for Venus represent the only global radar information available for any of the planets. In addition, the Pioneer Venus radar instrument was able to sound the surface at normal incidence so that it was possible to accurately measure the small-scale surface slopes and reflectivity (dielectric and porosity properties) at the same time as the surface elevation. Analyses of the topography of Venus demonstrate that it differs in its distribution from the Moon, Mars, or the Earth. While the range of topography extends from -2.5 km below the reference level to 11.5 km above, most of Venus falls within 1 km of the mean elevation, this is in sharp contrast to the Earth. The narrow, unimodal nature of the distribution of topography on Venus evidently exerts control on the other radar-derived properties of the surface. When clustering analysis techniques are applied to the Venus radar data sets, the result demonstrates that topographic zones serve as the best criteria for distinguishing regions on Venus which have related radar properties. The individual radar data sets are investigated separately and in conjunction with topography. A.R.H.

N84-21454*# Chicago Univ., Ill. Dept. of Geophysical Sciences.
HIGH-TEMPERATURE INCLUSIONS IN THE MURCHISON METEORITE c91
Lawrence Grossman *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 20-24 ref (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

Inclusions found in type 3 carbonaceous chondrites such as the Allende meteorite are described and compared with those in the Murchison type 2 carbonaceous chondrite. Scanning electron microscope studies of the SH-6 (containing abundant hibonite) and the GR-1 (containing abundant hibonite and corundum) are discussed. Because corundum and hibonite are higher temperature condensates than the melilite and pyroxene found in the Allende meteorite, it is concluded that most refractory inclusions in the Murchison meteorite were isolated from the solar nebular gas at a higher temperature than their counterparts in the Allende meteorite. Whether the inclusion crystallized from a liquid or condensed directly from solar nebular gas is discussed. A.R.H.

N84-21455*# Bordeaux Univ. (France). Lab. de Chimie Nucleaire.
COSMIC RAY EXPOSURE AGES OF IRON METEORITES, COMPLEX IRRADIATION AND THE CONSTANCY OF COSMIC RAY FLUX IN THE PAST c93
K. Marti, B. Lavielle, and S. Regnier *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 25-29 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

While previous calculations of potassium ages assumed a constant cosmic ray flux and a single stage (no change in size) exposure of iron meteorites, present calculations relaxed these constancy assumptions and the results reveal multistage irradiations for some 25% of the meteorites studied, implying multiple breakup in space. The distribution of exposure ages suggests several major collisions (based on chemical composition and structure), although the calibration of age scales is not yet complete. It is concluded that shielding-corrected (corrections which depend on size and position of sample) production rates are consistent for the age bracket of 300 to 900 years. These production rates differ in a systematic way from those calculated for present day fluxes of cosmic rays (such as obtained for the last few million years). A.R.H.

N84-21456*# Hawaii Univ., Honolulu.
VENUS ANALOGUES ON THE EARTH'S OCEAN FLOOR(?): VOLCANIC TERRAINS SEEN BY SEAMARC 2 SIDE SCAN SONAR c91
Peter J. Mouginis-Mark, Patricia Fryer, Donald Hussong, and Stanley H. Zisk (Northeast Radio Observatory Corp.) *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 30-33 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The geology of Venus is discussed. The approximate age of the surface and the relative importance of large scale volcanic, tectonic and sedimentary processes are not known. Venus holds a very important role in comparative planetology. The investigation of comparable environments to Venus to test ideas of landform development on that planet are proposed. E.A.K.

N84-21457*# Lunar and Planetary Inst., Houston, Tex.
IMPACT BASINS AND THE VOLCANICS OF MARS c91
Peter H. Schultz *In its* 15th Lunar and Planetary Sci. Conf. 1984 p 34-37 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The distribution fracture patterns of old Martian impact basins were studied. The basaltic plains on the Moon generally occur inside or around impact craters and basins and it is believed that fractures generated by large impacts provided long lasting pathways for magmas. The volcanic plains and volcanic edifices on Mars which show a complex distribution are the interiors of the most obvious old basins are largely buried by wind blown deposits. The Martian ridged plains that most resemble the lunar maria typically are offset from such impact basins. The origin of the mare like plains offset and the placement of the large volcanic mountains are discussed. E.A.K.

N84-21458*# New Mexico Univ., Albuquerque. Inst. of Meteorites.
PRIMITIVE METEORITES: WHERE DO THEY COME FROM AND HOW DO THEY FORM? c91
Edward R. D. Scott, G. Jeffrey Taylor, and Klaus Kell *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 38-40 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The most primitive meteorites are called chondrites; which contain small spherules called chondrules. Chondrules and the other ingredients in chondrites appear to have formed long before there were any planets in the solar system. The rocks offer clues to the earliest history of the solar system and an opportunity to understand how some of the small planets were formed, how they were heated and how they were affected by impacts. The origin of asteroids, that supply the meteorites is examined and two factors are proposed: (1) meteorites come from many different bodies that have formed and evolved in slightly different ways, and (2) impacts provide samples of both the surfaces and deep interiors of these bodies. E.A.K.

N84-21459*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
QUENCHED MAGNETITE IN CRETACEOUS-TERTIARY BOUNDARY MICROTEKITE-LIKE SPHEROID c91
Jan Smit, Frank T. Kyte, and John T. Wasson *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 41-44 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The magnetite containing spheres collected from a kt boundary localities in Italy were analyzed. It was found that these spheres contain relatively high concentrations of Ir. The spheres were analyzed for siderophile elements Ir, Pt, Au, Pd, Os, and Re. Elements Ir, Pt, Pd, and Au were found in high concentrations in magnetic spheres and their concentrations are similar to those in most meteorites. It is suggested that the magnetite spheres do not contain a meteorite component which may be a relic of the kt event. E.A.K.

N84-21460*# Cornell Univ., Ithaca, N.Y. Dept. of Geological Sciences.
WAS THE EARLY EARTH COMPLETELY MOLTEN? c46
Donald L. Turcotte and Joan C. Pflugrath *In* Lunar and Planetary

Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 45-46 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 08G

The nature of the interior of the primitive Earth was examined. The question is posted: was the Earth a cold solid or was it a hot liquid, much like a lava lakes seen in today's volcanic cauldrons. The various energy sources available to heat the primitive Earth to see if they are sufficient to cause melting were analyzed. The two largest contributors to the Earth's early heat appear to be the heat due to accretion and the heat of core formation. The Earth formed by the accretion of particles ranging in size from millimeters to hundreds of kilometers and each impact into the protoearth provided more energy to heat the body. It is found that early in the Earth's history, the sinking of iron to the center of the Earth to form the core released a substantial amount of energy; enough to heat the entire Earth an average 2000 deg C. Mechanisms for the removal of such a large amount of heat appear inadequate to prevent substantial melting, and it is assumed that the Earth was completely molten, i.e., a magma ocean at one time early in its history. E.A.K.

N84-21461*# Geological Survey, Lakewood, Colo.
THE Li-Hf EVOLUTION OF KREEP **c91**
D. M. Unruh and M. Tatsumoto *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 47-51 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The most widely accepted theory for lunar evolution is the cumulate remelting model. According to the model, the outer several hundred kilometers of the Moon were molten early in its history at about 4.4 to 4.5 billion years ago. As this magma ocean cooled minerals began to crystallize and accumulate either at the base or the top of the magma ocean depending upon the density of the mineral. The accumulated minerals at the base were partially remelted at about 3.9 to 3.2 billion years to produce the mare basalts. E.A.K.

N84-21462*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
FORMATION OF METEORITIC CHONRULES BY LIGHTNING **c91**
John T. Wasson and Kaare L. Rasmussen *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 52-55 ref (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

Chondrules which are enigmatic millimeter sized silicate grains embedded in the most common class of meteorites, the chondritic (stony) meteorites. It is shown that the chondritic rocks formed by sedimentation processes in the solar nebula, and that it escaped the subsequent melting processes which differentiated the planets from the meteorite parent bodies. E.A.K.

N84-21463*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
FORMATION OF CHONDRULES BY DRAG HEATING IN DUST-ENRICHED ENVIRONMENTS **c91**
John A. Wood *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 56-57 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

The solar system which had a beginning, 4.6 billion years ago is discussed. The atoms that make up the solar system are much older than that, however: they were also part of the universe that existed before the solar system formed. The presence and location of the atoms of silicon, iron, calcium, that make up the Earth and other planets before there was a solar system is questioned. Astronomical it is shown that they existed in tiny dust grains which, along with molecules of gas, wandered about in the vast reaches of space between the stars of our galaxy. The solar system was formed when one particular cloud of interstellar dust and gas became dense enough to be gravitationally unstable: the gravitational pull that dust grains and gas molecules exerted on one another caused the cloud to collapse. E.A.K.

N84-21464*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
TOWARD A COMPLETE INVENTORY OF STRATOSPHERIC DUST PARTICLES WITH IMPLICATIONS AND THEIR CLASSIFICATION **c46**
Michael E. Zolensky, Ian D. R. Mackinnon, and David S. McKay *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 P 58-59 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 04A

As the Earth travels about the Sun it continuously sweeps up material laying in its path. The material includes dust-sized fragments of the meteors, comets and asteroids that have passed by as well as much older particles from out between the stars. These grains first become caught in the mesosphere and then slowly pass down through the stratosphere and the troposphere, finally raining down upon the Earth's surface. In the stratosphere the cosmic dust particles encounter increasing amounts of contaminants from the Earth. At the highest reaches of Earth's atmosphere these contaminants consists mainly of dust from the most explosive volcanoes, rocket exhaust, and other manmade space debris. In the troposphere windborne particles and pollen become an increasingly larger fraction of the atmospheric dust load. An increased knowledge of the nature of cosmic particles is suggested. E.A.K.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N84-21465 Cornell Univ., New York, N.Y.
PHOTOMETRIC PROPERTIES OF EUROPA AND THE ICY SATELLITES OF SATURN Ph.D. Thesis
Bonnie Jean Buratti 1983 226 p
Avail: Univ. Microfilms Order No. DA8328658

Images obtained by the Voyager 1 and 2 spacecraft were used to derive the photometric properties of Europa and the medium-sized icy satellites of Saturn (Rhea, Dione, Tethys, Enceladus, Mimas, and Iapetus). A simple photometric law which describes the scattering properties of bright particulate surfaces is introduced. It represents adequately the disk-resolved scattering properties of the objects at all phase angles. For normal reflectances below 0.6, a lunar-like law is adequate. Disk-integrated phase curves, orbital light curves, phase integrals, geometric albedos, Bond albedos, intensity histograms and Minnaert parameters near opposition are determined. The photometric effects of macroscopic roughness are investigated in terms of a model in which the surface is covered with paraboloidal craters. A selected set of observations is fit to the complete theory of Hapke. The single particle scattering albedo, the compaction parameter, and the single particle phase function for the surfaces of Europa, Rhea, Enceladus, and Mimas are derived and compared to those of the Moon. Dissert. Abstr.

N84-21466# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
OPERATIONAL USES FOR A SOLAR SOFT X-RAY IMAGING TELESCOPE
S. T. Suess Jul. 1983 46 p refs
(PB84-137538; NOAA-TM-ERL-SEL-66; NOAA-83121902) Avail: NTIS HC A03/MF A01 CSCL 03B

Taken from space, above the Earth's atmosphere, X-ray images of the Sun reveal the structure of the corona and magnetic loops, flares and erupting filaments against a black solar disk. This information can be put to immediate use to improve present space environment monitoring and forecasting, and to provide entirely new products and services. An operational use exists, and details of this use are described here. Furthermore, the instruments necessary to make X-ray photographs have been flown on rockets and spacecraft many times so that no new technological develop-

ment would be required to realize the benefits to the Space Environment Services Center. GRA

N84-21467 Pennsylvania State Univ., University Park.
INTERNATIONAL ULTRAVIOLET EXPLORER OBSERVATIONS OF WOLF-RAYET BINARIES: WIND STRUCTURES Ph.D. Thesis
Gloria Koenigsberger Avena 1983 92 p
Avail: Univ. Microfilms Order No. DA8327515

Spectra of six WN + OB Wolf-Rayet systems obtained with the IUE are analyzed for phase-dependent variations. Periodic variability at emission ine frequencis is detected in V444 Cyg, HD 90657, HD 211853, HD 186943 and HD 94546 on low dispersion SWP (lambda lambda 1200 - 1900 A) images. No changes in the low dispersion spectra of HD 193077 are apparent. The variations in the UV are found to be similar in nature to those observed in optical spectra of various WR sources. That is, there is a strengthening of absorption components in P Cygni - type features at orbital phases in which the O-star is behind the WR wind. With the aid of a computer code which models this type of variations, and through a comparison with HD 193077, the dominant mechanism producing the variations is shown to be selective atmospheric eclipses of the O-star by the WR wind. Dissert. Abstr.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N84-21468 Texas Univ., Austin.
ELECTROMAGNETIC UNIVERSES Ph.D. Thesis
Sergio WallerMejia 1983 134 p
Avail: Univ. Microfilms Order No. DA8329886

The dynamical effects of spatially homogeneous electromagnetic fields on anistropic Bianchi types I, IX, V, and VII sub H are studied. The Lagrangians and Hamiltons affecting the evolution of anisotropy (including the gravitational and electromagnetic potentials) are obtained for very general spatially homogeneous metrics by means of Arnowitt, Deser, and Misner Hamiltonian formalism. for Bianchi type IX models having diagonal metrics an exact solution for the electromagnetic fields was obtained. This solution allowed a qualitative solution for the gravitational variables. The total solution is similar to that of Brill. A qualitative discussion of electromagnetic Bianchi types I and IX is presented, and a modified Lagrangian density which yields the correct field equations for Bianchi type class B models is derived. This modified Lagrangian density is used to obtain the Hamiltonians (including the gravitational and electromagnetic potentials) for Bianchi types V and VII sub H with diagonal metrics. Dissert. Abstr.

N84-21469 Portland State Univ., Oreg.
GALACTIC EXPLOSIONS, COSMIC DUST INVASIONS, AND CLIMATIC CHANGE Ph.D. Thesis
Paul Alex LaViolette 1983 759 p
Avail: Univ. Microfilms Order No. DA8324329

The hypothesis (Galactic Explosion Hypothesis, GEH) is put forth that about every 10,000 years or so the center of our Galaxy enters an explosive phase during which it generates an outburst of cosmic rays with total particle energies on the order of 10 to the 57th power ergs or more. These outbursts of superwaves, composed of highly relativistic electrons and positrons, would travel radially outward through the Galaxy at very close to the speed of light (approx. 0.99999c) with only moderate attenuation by the interstellar medium (approx. 20% loss of energy for the journey from the GC to the Sun). It is suggested that upon impacting the solar vicinity, the resulting 10 to the 3rd power fold elevation in the ambient cosmic ray energy density would initiate a sequence of events which could profoundly influence the Earth's climate. Astronomical and terrestrial evidence are presented to support the Galactic Explosion Hypothesis. Also, the results of a critical Earth-based test of the hypothesis are presented. In particular, it is reported that the polar ice concentrations of iridium and nickel (both good indicators of extraterrestrial material) rose by one to two orders of magnitude close to the end of the Last Ice Age. Dissert. Abstr.

N84-21470 Cornell Univ., New York, N.Y.
SIMULATIONS OF GALAXY MERGERS Ph.D. Thesis
Rida A. M. T. Farouki 1983 143 p
Avail: Univ. Microfilms Order No. DA8328580

N-body integrations are employed to investigate galaxy mergers and the structure of the resulting remnants. In encounters between identical disk-halo systems, the strength of orbital braking depends on the alignment of spin and orbital angular momenta, and the extent of overlap or intersection of the disks. Merging occurs from bound and marginally unbound orbits with significant overlap at pericenter. A merging cross-section is derived from a large number of encounters for the resonant case when both galaxy spins are aligned with the orbit. A variety of relative disk orientations at pericenter are examined for a single parabolic orbit. Remnants possess many features in common with ellipticals: they are generally oblate systems with low rotation velocities and Hubble profiles. The non-homologous nature of merging results in a remnant central velocity dispersion greater than the progenitor's peak rotation velocity. Dissert. Abstr.

N84-21471*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DETECTION OF EXTRASOLAR PLANETS BY THE LARGE DEPLOYABLE REFLECTOR
David J. Hollenbach and Takamasa Takahashi (Univ. of the Pacific) Mar. 1984 24 p refs
(NASA-TM-85874; A-9592; NAS 1.15:85874) Avail: NTIS HC A02/MF A01 CSCL 03B

The best wavelength for observing Jupiter-size planetary companions to stars other than the Sun is one at which a planet's thermal emission is strongest; typically this would occur in the far-infrared region. It is assumed that the orbiting infrared telescope used is diffraction-limited so that the resolution of the planet from the central star is accomplished in the wings of the star's Airy pattern. Proxima Centauri, Barnard's Star, Wolf 359, and Epsilon Eridani are just a few of the many nearest main-sequence stars that could be studied with the large deployable reflector (LDR). The detectability of a planet improves for warmer planets and less luminous stars; therefore, planets around white dwarfs and those young planets which have sufficient internal gravitational energy release so as to cause a significant increase in their temperatures are considered. If white dwarfs are as old as they are usually assumed to be (5-10 billion yr), then only the nearest white dwarf (Sirius B) is within the range of LDR. The Ursa Major cluster and Perseu cluster are within LDR's detection range mainly because of their proximity and young age, respectively. A.R.H.

N84-21472# Brookhaven National Lab., Upton, N. Y. Physics Dept.
TYPE II SUCCESSFUL SUPERNOVAE, THE ANATOMY OF SHOCKS: NEUTRINO EMISSION AND THE ADIABATIC INDEX
S. Kahana, E. Baron (State Univ. of New York), and J. Cooperstein (State Univ. of New York) 1983 21 p refs Presented at the Workshop on Stellar Collapse, Toulouse, 7-11 Nov. 1983
(Contract DE-AC02-76CH-00016)
(DE84-002858; BNL-33848; CONF-8311120-1) Avail: NTIS HC A02/MF A01

Hydrodynamic calculations of stellar collapse in Type II Supernova are described using a variable stiffness and compressibility for the nuclear equation of state at high density. Initial models employing a relatively small mass core with low central entropy are necessary to achieve viable shocks; near success the models are sensitive to both neutrino emission and the high density equation of state. The treatment of neutrino production and transport is reported. DOE

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N84-21473 Colorado Univ., Boulder.
VERTICAL STRUCTURE AND CONVECTIVE DYNAMICS OF THE EQUATORIAL REGION ON JUPITER Ph.D. Thesis
Carol R. Stoker 1983 218 p
Avail: Univ. Microfilms Order No. DA8400932

A model for the vertical cloud structure of Jupiter's Equatorial Plumes is deduced based on ground-based and Voyager spacecraft data. The hypothesis that the cloud structure can be explained by convective motions due to latent heat release is examined. Images of Jupiter in three wavelengths were used to constrain multiple layer radiative transfer models. Aerosols at altitudes above 1 bar were probed by ground-based images of Jupiter in the 8900 A strong absorption band of methane. Voyager images in the weaker 6190 A methane absorption band helped to probe aerosols at altitudes near and below the 1 bar level. Voyager images at 6000 A were used to determine the aerosol single scattering albedo. The data are consistent with a model for the vertical structure which includes several layers. Uppermost is a haze above 100 mbar. Dissert. Abstr.

N84-21474*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
SIGNIFICANT ACHIEVEMENTS IN THE PLANETARY GEOLOGY PROGRAM
James W. Head, III, ed. Mar. 1984 39 p
(Grant NsG-7570)
(NASA-CR-3782; NAS 1.26:3782) Avail: NTIS HC A03/MF A01 CSCL 03B

Recent developments in planetology research are summarized. Important developments are summarized in topics ranging from solar system evolution, comparative planetology, and geologic processes active on other planetary bodies, to techniques and instrument development for exploration. S.L.

N84-21475# Academy of Sciences (USSR), Moscow. Space Research Inst.
PROPOSALS FOR VIRA (VENUS INTERNATIONAL REFERENCE ATMOSPHERE): DYNAMICS AND STRUCTURE BELOW 100 KM
V. V. Kerzhanovich, M. Ya. Marov, and V. I. Moroa 1983 46 p refs
(Rept-831) Avail: NTIS HC A03/MF A01

First direct measurements of temperature, pressure and density in the Venus atmosphere were performed on board the Venera-4 automated station. Almost simultaneously Mariner-5 carried out radiosounding of the Venus atmosphere. Later on many other measurements of its structural parameters were made. All the data acquired were criticaly analyzed whereby a model for the vertical structure of the Venus atmosphere was developed. This model assumes the 92 bar pressure level as a zero (reference) level. The shape of the zero level surface is taken to be spherical with the radius of 6052 km. Temperature is equal to 737 K at this level. Table with T(H), P(H) and rho(H) is given with the height step deltaH= = 1 km for the basic model which describes the day and night atmosphere at latitudes from +50 to-50 deg. Besides Tables with T(H), P(H) and rho(H) are also presented for high latitudes. Porbable limits within which parameters can vary are discussed. S.L.

N84-21476*# Rockwell International Science Center, Thousand Oaks, Calif.
LUNAR SAMPLE ANALYSIS Annual Report, 1 Jan. - 31 Dec. 1983
R. M. Housley, E. H. Cirlin, R. S. Rajan, E. R. Rambaldi, and D. Want 30 Jan. 1984 26 p refs
(Contract NAS9-11539)
(NASA-CR-171772; NAS 1.26:171772; SC507.66AR; AR-12) Avail: NTIS HC A03/MF A01 CSCL 03B

Results are presented from an extensive series of new high resolution scanning electron microscope studies of the very primative group of meteorites known as unequilibrated chondrites. These include quantitative analyses of micrometer sized phases and interpretation in terms of relevant phase equilibria. Several new meteorite minerals including high chromium metal, have been discovered. B.W.

N84-21477*# Rockwell International Science Center, Thousand Oaks, Calif.
LUNAR SAMPLE ANALYSIS Annual Report, 1 Jan. - 31 Dec. 1982
R. M. Housley 26 Jan. 1983 9 p refs
(Contract NAS9-11539)
(NASA-CR-171771; NAS 1.26:171771; SC507.61AR; AR-11) Avail: NTIS HC A02/MF A01 CSCL 03B

The evolution of the lunar regolith under solar wind and micrometeorite bombardment is discussed as well as the size distribution of ultrafine iron in lunar soil. The most important characteristics of complex graphite, sulfide, arsenide, palladium, and platinum mineralization in a pegmatoid pyroxenite of the Stillwater Complex in Montana are examined. Oblique reflected light micrographs and backscattered electron SEM images of the graphite associations are included. A.R.H.

N84-21478*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
MINERALOGIC AND PETROLOGIC STUDIES OF METEORITES AND LUNAR SAMPLES Final Report, 1 Feb. 1971 - 31 Jan. 1984
John A. Wood Mar. 1984 16 p refs
(Grant NGL-09-015-150)
(NASA-CR-175390; NAS 1.26:175390) Avail: NTIS HC A02/MF A01 CSCL 03B

During a 13 year period beginning in 1971, the Extraterrestrial Petrology Group examined lunar soils from all 6 Apollo missions and those returned by the Soviet Luna 16, Luna 20, and Luna 24 missions. In addition, the properties and apparent origin of the carbonaceous chondrites were examined. Chondrules, calcium-aluminum-rich inclusions (CAI) and the fine grained matrix materials that accompany chondrules and CAI's in primitive meteorites were investigated. The effects of planetary hydrothermal alteration of matrix materials in the C1 chondrite was also investigated. Full length papers and extended abstracts published during the grant are listed chronologically. A.R.H.

N84-21479# Los Alamos Scientific Lab., N. Mex.
COMPUTER SIMULATION OF RECONNECTION IN PLANETARY MAGNETOSPHERES
Joachim Birn 1983 17 p refs Presented at the Intern. Astronomical Union Symp., College Park, Md., 8-11 Aug. 1983
(Contract W-7405-eng-36)
(DE84-001389; LA-UR-83-2515; CONF-8308148-1) Avail: NTIS HC A02/MF A01

The modelling of reconnection in well known geometries that are close enough to the idealized analytic models to make a comparison of the computer models with analytic theory meaningful is discussed. More detailed, even three dimensional, models can be used for a comparison with extended data from in situ observations. The reconnection picture that was based on two dimensional steady state models and linear analytic theory is confirmed. The three dimensional models in particular have added more information on the reconnection process and the structure of flow, magnetic fields, and currents which includes many features that are consistent with observations and empirical models of geomagnetic substorms. DOE

N84-21450*# National Astronomy and Ionosphere Center, Arecibo, Puerto Rico.

VOLCANISM AND RIFT FORMATION IN BETA REGIO, VENUS: NEW RADAR RESULTS
D. B. Campbell, J. W. Head (Brown Univ.), J. K. Harmon, and A. A. Hine *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 8-9 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21451*# State Univ. of New York, Albany. Dept. of Geological Sciences.
ORIGIN OF THE MOON: IN SEARCH OF THE HOLY GRAIL
J. W. Delano *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 8-9 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21453*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
VENUS: GLOBAL RADAR PROPERTIES IN A GEOLOGICAL CONTEXT
James B. Garvin *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 16-19 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21454*# Chicago Univ., Ill. Dept. of Geophysical Sciences.
HIGH-TEMPERATURE INCLUSIONS IN THE MURCHISON METEORITE
Lawrence Grossman *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 20-24 ref (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21456*# Hawaii Univ., Honolulu.
VENUS ANALOGUES ON THE EARTH'S OCEAN FLOOR(?): VOLCANIC TERRAINS SEEN BY SEAMARC 2 SIDE SCAN SONAR
Peter J. Mouginis-Mark, Patricia Fryer, Donald Hussong, and Stanley H. Zisk (Northeast Radio Observatory Corp.) *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 30-33 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21457*# Lunar and Planetary Inst., Houston, Tex.
IMPACT BASINS AND THE VOLCANICS OF MARS
Peter H. Schultz *In its* 15th Lunar and Planetary Sci. Conf. 1984 p 34-37 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21458*# New Mexico Univ., Albuquerque. Inst. of Meteorites.
PRIMITIVE METEORITES: WHERE DO THEY COME FROM AND HOW DO THEY FORM?
Edward R. D. Scott, G. Jeffrey Taylor, and Klaus Kell *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 38-40 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21459*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
QUENCHED MAGNETITE IN CRETACEOUS-TERTIARY BOUNDARY MICROTEKITE-LIKE SPHEROID
Jan Smit, Frank T. Kyte, and John T. Wasson *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 41-44 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21461*# Geological Survey, Lakewood, Colo.
THE Lf-Hf EVOLUTION OF KREEP
D. M. Unruh and M. Tatsumoto *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 47-51 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21462*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
FORMATION OF METEORITIC CHONRULES BY LIGHTNING
John T. Wasson and Kaare L. Rasmussen *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 52-55 ref (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21463*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
FORMATION OF CHONDRULES BY DRAG HEATING IN DUST-ENRICHED ENVIRONMENTS
John A. Wood *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 56-57 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N84-21480*# Stanford Univ., Calif. Center for Space Science and Astrophysics.
THE IMPULSIVE HARD X-RAYS FROM SOLAR FLARES
John Leach Feb. 1984 295 p refs
(Grant NsG-7092)
(NASA-CR-175431; NAS 1.26:175431; CSSA-ASTRO-84-06) Avail: NTIS HC A13/MF A01 CSCL 03B

A technique for determining the physical arrangement of a solar flare during the impulsive phase was developed based upon a nonthermal model interpretation of the emitted hard X-rays. Accurate values are obtained for the flare parameters, including those which describe the magnetic field structure and the beaming of the energetic electrons, parameters which have hitherto been mostly inaccessible. The X-ray intensity height structure can be described readily with a single expression based upon a semi-empirical fit to the results from many models. Results show that the degree of linear polarization of the X-rays from a flaring loop does not exceed 25 percent and can easily and naturally be as low as the polarization expected from a thermal model. This is a highly significant result in that it supersedes those based upon less thorough calculations of the electron beam dynamics and requires that a reevaluation of hopes of using polarization measurements to discriminate between categories of flare models. A.R.H.

N84-21481# California Inst. of Tech., Pasadena.
ANALYSIS OF FLARES OBSERVED DURING THE SOLAR MAXIMUM YEAR Final Report
Harold Zirin, Sara F. Martin, and Stephen R. Walton 1 Nov. 1982 8 p
(Contract N00014-82-K-0733)
(AD-A137922) Avail: NTIS HC A02/MF A01 CSCL 03/2

This report encompasses three major projects: (1) Qualitative characterization of the H-alpha profiles of the flare of 5 November 1980 at 2233 UT; (2) Construction of a film projector/digitizer for the purpose of projecting half-frame 35mm images onto a television camera detector; (3) Images of solar plages near the limb in broadband continuum, and analysis thereof. These projects are described in the respective three sections of this report. GRA

N84-21482# American Science and Engineering, Inc., Arlington, Va. Space Systems Div.
A STUDY OF CORONAL PRECURSORS OF SOLAR FLARES Final Report, 26 Jan. 1982 - 25 Jul. 1983
David F. Webb Hanscom AFB, Mass. AF Geophysical Lab. Aug. 1983 49 p
(Contract F19628-82-C-0028; AF Proj. 2311)
(AD-A137163; ASE-4818; AFGL-TR-83-0126) Avail: NTIS HC A03/MF A01 CSCL 03/2

This contract was to investigate the evidence for the character-

istics of solar coronal flare precursors using high spatial resolution Skylab soft X-ray, H alpha and magnetogram images. Transient preflare features were examined to develop an understanding of coronal flare precursors, especially what they tell us about changes in the local magnetic field. The results are as follows; Preflare X-ray enhancements were found in a statistically significant number of the preflare intervals searched, and consisted of one to three loops, kernels or sinuous features per interval. Typically, the preflare feature was not at the flare site and did not reach flare brightness. There was no systematically observed time within the preflare interval for the preflare events to appear, and, no correlation of preflare characteristics with the subsequent flare energy. Pressures of several preflare features were calculated to be on the order of a few dy/sq cm. H-alpha brightenings in the form of knots and patches cospatial with or adjacent to the X-ray preflare features were found in nearly all of the intervals searched. Changing H-alpha absorption features were observed in about half of the cases, and took the form of surges or filament activations. The results do not provide support for loop preheating models, but do support models which require emerging flux as a means of activating larger coronal structures which flare. Author (GRA)

N84-21483# National Geophysical Data Center, Boulder, Colo.
SOLAR-GEOPHYSICAL DATA NO. 470, OCTOBER 1983. PART 2: (COMPREHENSIVE REPORTS). DATA FOR APRIL 1983, DECEMBER 1980, JANUARY 1981 AND MISCELLANEA
Helen E. Coffey, ed. Oct. 1983 113 p refs
(PB84-140367; NOAA-84010402-Pt-2) Avail: NTIS HC A06/MF A01 CSCL 03B

Topics discussed include: solar flares, solar radio bursts at fixed frequencies, solar X-ray radiation from GOES 2, and Mass ejections from the Sun. GRA

N84-21484# National Center for Atmospheric Research, Boulder, Colo. High Altitude Observatory.
SUMMARY OF SOLAR ACTIVITY OBSERVED IN THE MAUNA LOA SOLAR OBSERVATORY, 1980 - 1983
K. Rock, R. Fisher, C. Garcia, and E. Yasukawa Nov. 1983 28 p refs Sponsored in part by National Science Foundation
(PB84-137587; NCAR/TN-221) Avail: NTIS HC A03/MF A01 CSCL 03B

The following technical note summarizes solar activity observed during the first four years operation of the experiment systems of the Coronal Dynamics Project, which are located at the Mauna Loa Solar Observatory. This short report has been produced with the general aim of providing users of Mauna Loa observations with a summary of data for specific events. So that this table might be as useful as possible, a comprehensive review of three sources was performed. The plain language logs, identified as the so-called observer's logs, the now-discontinued activity logs, and the prominence monitor quality control logs were the sources from which the information in the following tables was obtained. GRA

93 SPACE RADIATION

Includes cosmic radiation; and inner and outer Earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N84-21485*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MEAN EXCITATION ENERGIES FOR STOPPING POWERS IN VARIOUS MATERIALS USING LOCAL PLASMA OSCILLATOR STRENGTHS
John W. Wilson, Y. J. Xu (Old Dominion Univ.), Efstathios Kamaratos (Christopher Newport Coll.), and C.K. Chang (Christopher Newport Coll.) Mar. 1984 38 p refs
(Contract NCC1-42; Grant NsG-1614)
(NASA-TP-2271; L-15731; NAS 1.60:2271) Avail: NTIS HC A03/MF A01 CSCL 03B

The basic model of Lindhard and Scharff, known as the local plasma model, is used to study the effects on stopping power of the chemical and physical state of the medium. Unlike previous work with the local plasma model, in which individual electron shifts in the plasma frequency were estimated empirically, he Pines correction derived for a degenerate Fermi gas is shown herein to provide a reasonable estimate, even on the atomic scale. Thus, the model is moved to a complete theoretical base requiring no empirical adjustments, as characteristic of past applications. The principal remaining error is in the overestimation of the low-energy absorption properties that are characteristic of the plasma model in the region of the atomic discrete spectrum, although higher-energy phenomena are accurately represented, and even excitation-to-ionization ratios are given to fair accuracy. Mean excitation energies for covalent-bonded gases and solids, for ionic gases and crystals, and for metals are calculated using first-order models of the bonded states. A.R.H.

N84-21486*# California Univ., Berkeley. Space Sciences Lab.
DATA REDUCTION AND ANALYSIS FOR ISEE-A AND -B ENERGETIC PARTICLES FLUX EXPERIMENT AND ISEE-C ELECTRON AND X-RAY EXPERIMENTS Final Technical Report, 1 Nov. 1979 - 30 Sep. 1983
Kinsey A. Anderson Feb. 1984 7 p
(Contract NAS5-25980)
(NASA-CR-175220; NAS 1.26:175220) Avail: NTIS HC A02/MF A01 CSCL 03B

A summary of the data reduction and analysis activities from late 1979 to late 1983 is presented. A bibliography of publications is included. M.A.C.

N84-21487*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CASE FOR ANTIPARTICLES IN THE EXTRAGALACTIC COSMIC RADIATION
F. W. Stecker and A. W. Wolfendale Jan. 1984 13 p refs Submitted for publication
(NASA-TM-86070; NAS 1.15:86070) Avail: NTIS HC A02/MF A01 CSCL 03B

The presence of an excess of low energy antiprotons in the primary cosmic radiation has given rise to a number of possible explanations. The possibility that these are extragalactic in origin is considered and it is shown that there are interesting implications for the bulk of the cosmic radiation at higher energies. In particular, it may be possible to account for a previously puzzling feature, a bump in the cosmic ray energy spectrum in the energy range 10(14) to 10(15) eV, with this primary extragalactic origin hypothesis. A method for testing this hypothesis experimentally is also described. M.G.

N84-21488*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTICAL CHARACTERISTICS OF YOUNG QUASARS AS SOURCES OF THE COSMIC X-RAY BACKGROUND
E. Boldt and D. Leiter Jul. 1983 27 p refs Submitted for publication
(NASA-TM-85069; NAS 1.15:85069) Avail: NTIS HC A03/MF A01 CSCL 03B

The sources which dominate the thermal cosmic X-ray background cannot have X-ray spectra similar to the power laws measured for bright active galactic nuclei. The optical consequences of this disparity are pursued by considering a standard model for the photoexcitation and heating of the line emitting gas surrounding a central source (e.g., such as a quasar). The optical line emission to be associated with compact young quasar sources having the same X-ray spectrum as the X-ray background is found to be substantially different from that characteristic of typical quasars. Implications on quasar source counts and the identification of such new objects are discussed. M.G.

N84-21489# Franklin Inst., Newark, Del.
PARTICLE THEORY, COSMOLOGY AND RELATIVITY Progress

Report, 1 Aug. 1983 - 31 Mar. 1984
T. K. Gaisser and G. Steigman 9 Dec. 1983 19 p refs
(Contract DE-AC02-78ER-05007)
(DE84-003990; DOE/ER-05007/20) Avail: NTIS HC A02/MF A01

Research progress on the following topics is: calculation of neutrino flux produced by cosmic rays, multiple muon events in deep underground detectors, large air showers, primordial nucleosynthesis, supersymmetry and equilibrium in the very early universe, the bag model of particle interactions, and particle theory in curved spaces. Publications are listed. DOE

N84-21449*# Lunar and Planetary Inst., Houston, Tex.
COSMIC RAY EXPOSURE OF SNC METEORITES AND CONSTRAINTS ON THEIR DERIVATION FROM MARS
D. D. Bogard, P. Johnson, and L. E. Nyquist *In* Lunar Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 1-4 (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

N84-21455*# Bordeaux Univ. (France). Lab. de Chimie Nucleaire.
COSMIC RAY EXPOSURE AGES OF IRON METEORITES, COMPLEX IRRADIATION AND THE CONSTANCY OF COSMIC RAY FLUX IN THE PAST
K. Marti, B. Lavielle, and S. Regnier *In* Lunar and Planetary Inst. 15th Lunar and Planetary Sci. Conf. 1984 p 25-29 refs (For primary document see N84-21448 11-88)
Avail: SOD CSCL 03B

99 GENERAL

N84-21490# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CALENDAR OF SELECTED AERONAUTICAL AND SPACE MEETINGS
Dec. 1983 45 p In FRENCH and ENGLISH
(AGARD-CAL-83/2; ISBN-92-835-0344-9) Avail: NTIS HC A03/MF A01

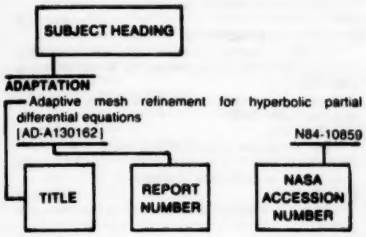
Produced in June and December of each year, this calendar shows the locations, dates, sponsoring organizations, and principal topics discussed at many scientific and technical meetings planned for the period covered. A key word index is provided along with the acronyms and addresses of the organizations. The meetings are listed chronologically under each of the following categories: aerospace medicine and biology; electronics, optics, and metrology; flight mechanics; fluid dynamics and acoustics; navigation, guidance, and control; thermodynamics, combustion, propulsion, and energetics; structures, materials, and applied mechanics; atmospheric physics and Earth environment; information, documentation and data processing; interdisciplinary and other topics; exhibitions and displays; and educational courses. A.R.H.

N84-21491# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
DEVELOPMENTS IN SCIENCE AND TECHNOLOGY
M. B. Gilbert and A. L. Machurek 1982 199 p refs
(Contract N00024-83-C-5301)
(JHU/APL-DST-10) Avail: NTIS HC A09/MF A01

In addition to fundamental research, activities are reported in the areas of: (1) weapons development; (2) naval warfare analysis; (3) computer technology; (4) space science and technology; (5) ocean science and technology; (6) biomedical science and engineering; and energy, engineering, and civilian technology. Invention, disclosures, patient applications, and patents issued are listed as well as papers published and/or presented. An author index is included. A.R.H.

SUBJECT INDEX

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7051).

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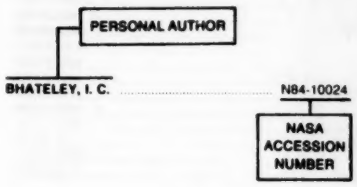

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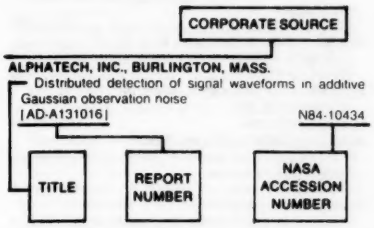

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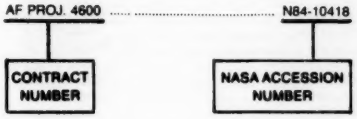

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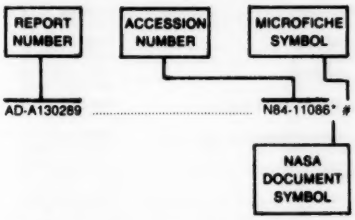

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